

APF

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ASIA PACIFIC FIRE MAGAZINE



REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

G-Force Nozzles: The Inside Story

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As the global leader in the design of high performance water supply equipment, TFT's new low profile intake valve provides maximum flow with minimal friction loss.

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*Husqvarna K970 Rescue-94cc, 4.8 kW,
350mm diamond blade, 11.0 kg*



*Husqvarna K760 Rescue-74cc, 3.7 kW,
300mm diamond blade, 9.7 kg*



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**Graham Collins**

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You Never Stop Learning

One of the many consequences of the changing weather patterns that seem to be affecting just about every corner of the world is that firefighters and rescue personnel are being faced with challenges on an unprecedented scale. Natural disasters are becoming far more frequent, more severe, and are cropping up in places where, historically at least, they have never occurred before.

To meet these challenges with a coordinated approach promptly, efficiently and safely, training is absolutely imperative. This needs to be conducted at every level – from the very “top brass” to the guy putting his or her life at risk in a collapsed or burning building – and this training needs to be frequently updated with refresher training to take account of new techniques and equipment and to ensure that no bad habits have surreptitiously crept in since the previous round of training.

While training budgets have, like every other area of expenditure, come under the microscope there has never been such a wide selection of training methods and techniques from which to choose. For example, many of the online or computer delivered training programmes are today strikingly realistic and versatile, thanks in part to developments in computer technology. In fact, without these IT advances it is difficult to see how training for such a diverse range of fire, rescue and hazard challenges could possibly be met either practically or cost-effectively, or be delivered to such large audiences.

Not that these computer-based solutions have necessarily made obsolete the hands-on experience that can be delivered at training academies and fire training schools by fully qualified professional firefighters with nationally accredited training qualifications. Additionally, advances in training simulators have taken hands-on training to a new level, as I addressed in an article in the previous edition of *Asia Pacific Fire* (Tell, Show, Do – the Delivery of Effective ARFF Training) following a visit to Airservices Australia’s new Aviation Rescue and Fire Fighting (ARFF) training facility at Melbourne Airport.

Similarly, sharing experiences and learned lessons with other firefighters and rescue personnel can play a major role in building fire and rescue

personnel’s skill and experience base and should be encouraged at every level. The guy at the sharp end often has invaluable experience that can and should be passed on to colleagues. While this frequently happens informally, there appear to be huge benefits where this interaction is formalised.

The probable fact is that the most effective training is a combination of all of the available techniques and delivery methods. We should never underestimate the importance of formal training and certification but, equally, we will ignore at our peril the invaluable experience that “old hands” can pass on. The important thing – indeed the “acid test of training” – is, whatever method was used, has the firefighter or rescue specialist learnt the skills enough to perform them consistently, effectively and safely? In the end, it is not so important how the lesson is delivered; the important issue is that the lesson has been learnt.

That is why we devote so many editorial pages of *Asia Pacific Fire* (and our sister publication *International Fire Fighter*) to training and acquiring and sharing knowledge about every aspect of fire behaviour, firefighting and rescue. It is why we have an ongoing and open invitation to anyone – manufacturer, academic, training establishment or fire and rescue personnel – to share their knowledge and experience through our editorial pages. My email address is at the top of this page, so if you have something you would like to add to the training debate, let me know. Who knows, what you have to say may one day save a life. **APF**

The more eagle-eyed readers may have noticed a subtle change with this edition of *Asia Pacific Fire*. We have moved the cover date forward by a month to more accurately reflect when the magazine is current. So, in future, APF will be flagged as January, April, July and October but the editorial copy and advertising deadlines remain unchanged.



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Kenneth R. Willette

NFPA

Firefighter Safety Knows No Bounds

As the National Fire Protection Association (NFPA) travels the world, while we may experience different cultures and approaches to the delivery of fire and rescue services, one common denominator can always be found, the dedication and commitment of the safety of its firefighters.

Last year, NFPA's Guy Colonna, Division Manager Industrial & Chemical Engineering and I, presented at the China Fire Officer Conference held at the Shanghai Fire Academy. Invited by China's Operation and Training Division, Ministry of Public Security (MPS), the Fire Officer Conference is an annual gathering of senior command officers from all around the country. More than 100 senior fire officers attended and an additional 50 participated through live transmission at this year's conference, which focused on hazardous materials safety, lessons learned and best practices regarding response to hazardous materials incidents and emergency planning for such events.

During the discussion, NFPA shared how its Standards are utilised in the United States to enhance firefighter safety and reduce line of duty

explained, the critical difference between these events was the ability of the fire service to recognise the danger early on, initiate a multi-agency response, and assume an operational posture that provided for civilian and responder safety.

Guy Colonna and I went on to illustrate how the U.S. Fire Service responds to hazardous materials incidents, explaining the typical training and operational structure for hazmat response. NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction* and NFPA 1620, *Standard for Pre-Incident Planning* were two of many NFPA Standards available to assist fire departments in planning and responding safely, creating a safer environment for firefighters to work, and assist in the reduction of firefighter deaths and injury from similar high-risk, low-frequency events.

During last year's China Fire Officer Conference at the Shanghai Fire Academy, NFPA shared how its Standards are utilised in the United States to enhance firefighter safety and reduce line of duty deaths and injuries during a hazardous materials incident; an important issue for the Chinese. NFPA also provided a perspective on the evolution of NFPA 400, *Hazardous Materials Code* and utilised three incidents to illustrate different tactical approaches and lessons learned.

deaths and injuries during a hazardous materials incident; an important issue for the Chinese. NFPA also provided a perspective on the evolution of NFPA 400, *Hazardous Materials Code* and utilised three incidents to illustrate different tactical approaches and lessons learned.

Two ammonium nitrate explosions that resulted in dozens of responder deaths were among the examples. The first explosion involving a ship carrying ammonium nitrate in Texas City, Texas in 1947 killed 26 firefighters; the second, a bulk fertilizer storage facility explosion in West, Texas in 2013, resulted in 13 responders killed. Both of these explosions stand in stark contrast to the response of the Fire Department of New York in 2010 to a vehicle-borne improvised explosive device (VBIED) in Times Square in New York City that resulted in zero responders killed or injured. As NFPA

Central to NFPA's mission is the development of codes and standards to reduce the worldwide risk from fire and other related hazards. This includes the risk of death and injury during emergency operations shared by firefighters across the globe. NFPA is honoured to support the China Ministry of Public Security and its global partners in utilising NFPA Standards as a framework to reduce death and injury sustained by firefighters in the line of duty. When it comes to fire safety, NFPA Standards provide a common language where there are no geographical boundaries.

To view NFPA 472, *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*, please go to www.nfpa.org/472. To view NFPA 1620, *Standard for Pre-Incident Planning*, please go to www.nfpa.org/1620.

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Kenneth R. Willette is
Division Manager, Public Fire
Protection at NFPA

For further information, go to
www.nfpa.com

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FLUOROCHEMICALS

New Firefighter Biker Gear

BRISTOL UNIFORMS has launched a new, lighter weight version of its firefighter professional motorcyclist standard PPE, aimed at the needs of fire and rescue services in hot and humid climates.

This latest derivation has been designed to provide first responder firefighter motorcyclists with both flame and physical protection. Considerably lighter in construction than the original design, the coat and trouser combination will provide EN469 Level 1 flame protection and feature a water repellent finish with thermal protection. Fitted with removable body protection for knees, elbows and shoulders, the coat will also feature an optional back-plate for added physical protection.

For more information, go to www.bristoluniforms.co.uk



Petrochemicals and Storage Tank Foam Announced

DR STHAMER has announced the global launch of its latest product, Moussol APS 1x3 F-0 Premium, AR-AFFF 1x3 firefighting foam, especially formulated and developed for the petrochemicals and storage tank industry. It is designed for use at 1% induction on hydrocarbon fires and at 3% induction on alcohol/polar solvent fires.

The new foam has been developed to be used in mobile foam attack using monitors and hand-lines and also in fixed foam fire protection systems, to give rapid flame knockdown and excellent burn-back resistance, which Dr Sthamer says ensures the safety of firefighters and the assets being protected. It has been tested to the LASTFire protocols and achieved "good" results. The new foam has also been certified by MPA Dresden to EN1568 Pt 3, achieving 1A/1A ratings.

Moussol APS 1x3 F-0 Premium utilises the latest generation C6 carbon chain fluorosurfactants that comply fully with EU757-2010 POP Regulations (persistent organic pollutants) and the US-EPA 2015 guidelines on Fluorosurfactants.

For more information, go to www.sthamer.com

New Intrinsically-safe Sounders

E2S has launched high-performance, intrinsically safe alarm horn sounders and combination devices with aluminium enclosures. The IS-D105 sounder and IS-DL105 combination device are approved to IECEx and ATEX standards for Zone 0 and the IP66 sealed marine-grade aluminium enclosure is phosphated and powder coated, offering enhanced protection for onshore and offshore applications.



The alarm horn produces up to 105 dB(A) at one-metre with a choice of 49 alarm tones and two additional, remotely selectable, alarm stages. For specific applications, custom tone configurations and frequencies can be engineered. The sounder can be combined with an LED beacon featuring an array of six high-intensity LEDs.



The alarm sounder and LED beacon can be powered through a single Zener barrier or galvanic isolator. Alternatively, the audible and visual elements of the IS-DL105 combination model can be controlled individually. When cabled with a common power supply, the sounder features an alarm accept function. By

closing a pair of external contacts such as a push switch, the operator may silence the alarm for set periods between five seconds and two hours. The LED beacon continues to flash at twice its normal frequency providing indication of an ongoing alarm condition. If after the pre-set time the alarm condition still exists the alarm horn will activate again.

For more information, go to www.e2s.com

Secutech 2014 Events

SECUTECH is taking place between 19th and 21st March at the Taipei Nangang Exhibition Centre in Taiwan and Secutech Vietnam is being held from 20th to 22nd August at the Saigon Exhibition & Convention Centre in Ho Chi Minh City, Vietnam.

According to the Taiwan show's organiser, around 80 percent of the 560 or more participating companies plan to launch new products or solutions in the first quarter of 2014. To enrich visitors' experience, Secutech is providing a range of unique and creative activities during the exhibition. The Secutech Vietnam event is expected to welcome more than 4,500 professional buyers to see the latest products and services from over 100 exhibitors.

For more information, go to www.secutech.com and www.secutechvietnam.com

Simple Decontamination for HazMat Response

Since 1990, DQE has been a leader in manufacturing and distributing portable decontamination shower systems that simplify the decontamination process for HazMat incident response. The company provides practical products and expert support that improves the safety and readiness of the response community. Headquartered in Fishers, Indiana, DQE proudly celebrates over 20 years of service.

When a HazMat incident occurs, decontamination procedures should be easy to carry out, not a liability due to a cumbersome decontamination system. DQE breaks down its decontamination shower philosophy into four concepts: fast setup; complete water coverage; simple cleaning; and easy transport.

- **Fast Setup**

Quick-connect, camlock fittings on the shower pipes make assembling showers fast and easy.

- **Complete Water Coverage**

The spray-pattern of DQE showers provides a “wall-of-water” to ensure fast and thorough water coverage.

- **Simple Cleaning**

The showerheads are easily cleaned after an event. Just unclamp the showerhead from the pipe and unscrew the nozzle.

- **Easy Transportation**

All DQE showers are portable and ready to be moved at a moment’s notice. The heavy-duty vinyl bags that hold the showers have drainage holes that provide clean storage and easy transport.

Whether there is one victim or multiple victims that need to be decontaminated, or responders that need to decontaminate at the scene, DQE designs a whole range of decontamination equipment and accessories – all that keep “simple decontamination” in mind.

Standard Decontamination Shower

The standard decontamination shower system is the first decontamination shower DQE manufactured and still remains its bestselling shower system. The standard decontamination shower system is a practical solution for victim and responder decontamination incidents. This shower can be configured to accommodate fully, semi, and even non-ambulatory victims and has an attachable enclosure with translucent roof for privacy and safety.

Quick Response Decontamination Shower

Designed for field response, the Quick Response decontamination shower is durably constructed to withstand frequent training. The set-up time for this decontamination shower is between two and three minutes, which makes it particularly useful in situations where quick deployment is critical.



Indestructo Decontamination Shower System

Constructed of ABS thermoplastic, the Indestructo is highly resilient, and is designed to stand up to the most rugged conditions. The four showerheads have a total output of 70 litres-a-minute for maximum water coverage, while two attachable windscreens reduce overspray.

Decono Shower

The simplest of all DQE showers, the Decono is an ultra-light alternative to full-size showers. It is designed for limited-space, tactical or field applications.

MASCAS Shower System

The MASCAS shower can easily be expanded to decontaminate multiple individuals simultaneously using from one to four shower stalls and two additional hand-held sprayers. Divider curtains separate individual stalls if victim privacy is needed.

DQE’s shower systems carry a lifetime warranty against manufacturing and material defects. As the manufacturer all its showers, DQE can fit them to custom specifications and provide replacement parts as needed. DQE also carries a variety of brushes, collection pools, pumps, and hoses to supply everything a responder needs for portable decontamination. **APF**

For more information, go to www.dqeready.com/decon



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Rescuers have been working with Holmatro for decades. It's easy to see why. We've been developing, producing and testing innovative rescue equipment for nearly half a century. This expertise is at the heart of our New Car Technology (NCT) cutter range. Our high-power tools enable you to work efficiently under pressure. As a result, it's safer, easier and quicker to save lives with Holmatro. That's why our products are the tools of choice for rescuers throughout the world. Once you use them, you'll use them for life.

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New Horizontal Ram Bracket



ZICO has unveiled the QM-RB-1 Quic-Mount horizontal ram bracket, heralded as being an inexpensive alternative to custom box fabrication. The heavy-duty, aluminium QM-RB-1 is designed to safely and securely store one hydraulic or battery-powered ram tool inside the compartment.

Mounting to nearly any flat surface, the QM-RB-1 consists of an aluminium bracket, a thick nylon strap, and a large plastic buckle that is easy to operate with or without gloves. When needed, the tool is simply unbuckled and lifted off the shelf.

For more information, go to www.ziamatic.com

New Conventional & Twin-Wire System

ADVANCED, has launched a new conventional and twin-wire fire system called QuickZone, described as being quick to install, configure and maintain. The system can cover from two to 12 zones and is EN54-2&4 approved. It comes in two panel formats; the standard and stand-alone QuickZone and the QuickZone XL, which also features a passive or fully functional repeater.

Both are compatible with a wide range of conventional devices and offer a host of flexible zone, input and output programming options. Both also offer test and false alarm management modes. Interfaces are simple; buttons are colour-coded with management and programming accessible via code entry or key-switch. QuickZone's enclosures are designed to make installation and wiring simple.

QuickZone is available in all of Advanced's EN54 territories including the UK, Europe, Africa, the Middle East and Asia.

For more information, go to www.advancedco.com

Communications Rope

LEADER has introduced Leader Com, a communication rope that is a rope incorporating a communication wire that offers all the same working properties of a conventional climbing rope. It is designed for high-angle extrication, confined space rescue and underground rescue, and ensures continuous, reliable and clear communication between the members of teams engaged in confined space entry and those managing the incident, particularly so when working in noisy environments or where other conventional communications do not work.

Leader Com allows up to ten team members to be connected on the system providing communication between one another and the incident management, up to a distance of 4.8 km for each connected user. For high angle working configurations, or for rope access, the communication rope can replace the primary rope or the life line.

For more information, go to www.leader-group.eu

Power redefined

The new SP 53 BS Spreader from WEBER RESCUE SYSTEMS is an absolute breakthrough. More power, bigger range and less weight!

With 53 kN minimum spreading force at the tips, large opening of 800 mm and only 20 kg weight, this spreader easily meets the highest requirements of the EN/NFPA standards.

Plus, as usual, some little special features like further improved tips with studs for even better grip and captive pins.

The new SP 53 BS is classified in category BS 53/800-20 and is the only BS spreader in this weight category.

The slim construction enables easy handling and is ideally suited to today's automotive materials and demands! Its arms and the cylinder body are made of aluminum alloy, which is also used in aircraft manufacturing and which is extremely lightweight.



Technical data:

Spreading force* in working range	53-421 kN
Closing force*	100 kN
Spreading distance	800 mm
Weight	20.3 kg
EN class	BS 53/800-20
Part no.	1058125

*according to EN 13204 to 700 bar

For more information, go to www.weber-rescue.com

Fire Safety for Indian Tower Blocks

FIKE SAFETY TECHNOLOGY has supplied its Quadnet analogue addressable system for a Wembley Estate residential building complex in India, which comprises eight tower blocks with 13 floors in each.

The installation consisted of five conventional manual call points on each floor, wired to an input module in an addressable detector. A single four-loop Quadnet panel communicated with all 575 addressable detectors in all eight towers. No additional sounders were required to be installed, as the built-in sounders in the detectors were used where required.



For more information, go to www.fikesafetytech.co.uk

New Rescue Saw

The K 970 Rescue from HUSQVARNA is specially designed for rescue and clearing work. It has what Husqvarna describes as a unique power-to-weight ratio and is equipped with features. These include the new generation Active Air Filtration, a centrifugal air cleaning systems that offers up to one year's operation without a filter change and SmartCarb, a built-in automatic filter compensation and a vibration dampening system.

The K 970 Rescue has a robust DuraStarter starter and an extra-large starter handle with space for bulky gloves. Control of the cutter is facilitated by the chromium-plated blade guard that is visible in smoke and water spray, and the adjustable carry strap allows for maximum freedom of movement. The K 970 Rescue is equipped with an X-Torq engine, which is said to reduce emissions by up to 75 percent and lower fuel consumption by 20 percent. Air purge and a decompression valve make it easy to start.

For more information, go to www.husqvarnacp.com



New Cordless Smoke Generator

HAAGEN has introduced the Vico, a portable robust smoke generator that works on a rechargeable battery, enabling firefighters to conduct training in situations anywhere.



With a heating up time of between one and two seconds, the Vico produces instantly a dense, thick and high quality dry smoke without leaving any residue. Weighing just 8 kilogrammes and with a smoke release button built into the grip, it can be operated with one hand, even when wearing a glove.

The Vico produces up to 150 cubic metres of smoke a minute, and users can adjust the smoke density and create smoke bursts, or set the output to continuous run of smoke for 20 minutes.

Via its WiFi capability the Vico can be operated and controlled by a connected laptop computer, tablet, smartphone or handheld device. With the optional wireless or wired remote control the Vico can be operated from a distance.

The VICO can be used in conjunction with Haagen's Etna and Vesuvius smoke generators to add smoke to secondary rooms and floors of a training building or in conjunction with a Jeff or Lowieke SmartDummy for victim extrication drills and search and rescue training.

For more information, go to www.haagen.com

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A&NZ Disaster & Emergency Management Conference



5th to 7th May 2014, Gold Coast, Queensland, Australia

Australian and New Zealand communities are continually facing heart-breaking losses caused by the increasing severity and frequency of natural disasters. The impacts of bushfires, floods, cyclones, earthquakes, storms and a host of other natural hazards not only affect communities but also both nations' economies, the infrastructure and the environment.

The scale of the challenge is huge. According to research carried out by Deloitte Access Economics for the Australian Business Roundtable for Disaster Resilience and Safer Communities, without action, the forecast annual cost in real terms of natural disasters (across government, business and communities) in Australia is expected to reach A\$23 billion by 2050. This highlights the need for investment further in resilience measures. Currently, each year an estimated A\$560 million is spent on post-disaster relief and recovery by the Australian Government compared with an estimated consistent annual expenditure of \$50 million on pre-disaster resilience.

Associate Professor, Brett Aimers, Chief Professional Officer with St John Ambulance Australia, says: "While progress has been made working in partnership with communities to make them more resilient, the emergency management sector, irrespective of the state and territory boundaries, face and will continue to face similar and emerging challenges. We must be focused on not only planning and preparing for the known emergencies of today but also the unknown emergencies of tomorrow."

These challenges will be addressed at this year's Australian & New Zealand Disaster and Emergency Management Conference that is being held at the QT Hotel Gold Coast from the 5th to 7th May 2014. The conference is a joint initiative of three 'not-for-profit' organisations: the Australian Institute of Emergency Services; Australian & New Zealand Mental Health Association; and the Association for Sustainability in Business.

The conference committee has created a comprehensive forum that shines a spotlight on resilience and offers professionals (and future professionals) an opportunity to advance and improve approaches, thoughts and opinions and develop expertise, competencies and aptitudes relating to information and facts surrounding preparedness for future disasters, emergencies and hazards, and the ability to recover from them quickly and efficiently.

Acknowledging that a 'whole-of-nation' resilience-based approach to disaster management and a national, coordinated and cooperative effort is needed to enhance our capacity to withstand



and recover from emergencies and disasters, this conference will examine the issues surrounding natural and man-made hazards and incorporate keynote addresses, concurrent sessions and workshops covering a vast array of subjects. These will include: emergency management; public safety; security; community resilience; business continuity; data protection and much more.

The line-up of renowned national and international speakers will include: Associate Professor Brett Aimers, Chief Professional Officer, St John Ambulance Australia; Dr Penny Lynn Burns, Department of General Practice, University of Western Sydney; Mr Neil Comrie, Bushfires Royal Commission Implementation Monitor; Mark Crosweller, Director General, Emergency Management Australia; Dr John Durkin, Director, BeTr Foundation, UK; Dr Ljubica Mamula-Seadon, Director, Seadon Consulting & Research and Major General S.L. SMITH, Commander 1st Division/Deployable Joint Forces Headquarters.

There will be a number of streams and informative workshops, as well as an all-encompassing exhibition showcasing equipment, products, services and solutions. The conference is an outstanding platform for education and to initiate new business relationships. The event is not to be missed by anyone involved in emergency management and disaster response and recovery. Registration to attend the three-day event can be made online at www.anzdm.com.au or via emailing the secretariat for the conference at conference@anzdm.com.au

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For more information, go to
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Australian & New Zealand Disaster and Emergency Management Conference

The 2014 Australian & New Zealand Disaster and Emergency Management Conference will examine what we have learnt in the past few years and provide a comprehensive forum that shines a light on resilience and offers professionals an opportunity to examine the expertise, competencies and systems relating to the preparedness for future disasters, emergencies and hazards and the ability to recover from them quickly and efficiently.

The event will bring together key stakeholders involved in the prevention, management and recovery of major disastrous events, a forum to examine the issues surrounding natural and man-made hazards.

■ Keynote Speakers include

Associate Professor Brett Aimers OSTJ, FRCNA (vic)
Chief Nurse, St John Ambulance Australia

Dr Penny Lynn Burns BMed MPHTM, Senior Lecturer,
Department of General Practice, University of Western Sydney

Mr Neil Comrie AO, APM
Bushfires Royal Commission Implementation Monitor

Mark Crosweller AFSM
Director General, Emergency Management Australia

Hon. Lianne Dalziel
Mayor of Christchurch

Dr John Durkin
Director, BeTr Foundation, London UK

Dr Ljubica Mamula-Seadon
Visiting Associate Professor, Disaster Prevention
Research Institute, Kyoto University

Major General Stuart Smith DSC, Am
Commander 1st Division / Deployable Joint Forces Headquarters



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PPE – The Way Ahead

Leading textile manufacturer, Hainsworth, is finding that its distinguished British heritage is increasingly a hit at home and abroad, thanks to the company's approach to innovation, quality and global partnerships, which ensures continuing demand.

Hainsworth is always proud to receive visitors to its historic mill in Yorkshire, England. While senior fire officers from the UK are frequent visitors, during the course of a typical year the company will also welcome delegations from China, Australia, the United States and the Middle East. Hainsworth has been working with firefighters since Britain's Metropolitan Fire Brigade Act 1865, but it is since the King's Cross underground fire disaster in London in 1987 that Hainsworth has come to the fore in the development of PPE for firefighters.

Everyone who works at Hainsworth is passionate about producing the highest quality fabrics and cloths for use in a number of different sectors and industries. Companies such as Hainsworth are demonstrating that Britain still has a strong manufacturing capability. Working closely with the end user is integral to the development of every product innovation being considered by the team at Hainsworth. While this something that is relatively easy to do in the UK, dedicated time is also set aside to get alongside fire services in other parts of the world.

Last year, while attending AFAC in Melbourne, both Simon Burnett-Boothroyd, Hainsworth's Sales and Innovation Executive, and Managing Director Tom Hainsworth, spent time with both wildland and structural firefighters, understanding the very different challenges each faces. When Simon returns to Australia again at the end of March, he plans to catch up with wildland firefighters who have continued to face extreme conditions tackling some of the worst bushfires seen in the country.

All of the information Hainsworth gleans from spending time on the front line is fed into its dedicated textile innovation centre, which includes a UKAS-accredited testing laboratory. When combined with its fully integrated, vertical textile mill – with its own spinning, weaving, dyeing and finishing, printing and fabric conversion machinery – it gives Hainsworth a genuine point of difference in the marketplace. Because the company has its own laboratory, it is able to rigorously test all products for protection, durability, comfort, performance and all the other requirements of the modern firefighter.

Heat stress management is now rightly at the top of the firefighting agenda around the world and continuing to develop innovative fabrics that assist in this process remains a key priority for Hainsworth. Growing awareness of the problem – considered to be the biggest threat to the safety of firefighters – can be seen in the introduction of various standards in recent years.



These include the incorporation of water vapour resistance testing into EN469:2005, the introduction of a physiological Annex F into the latest revision of EN469 and the development of the sweating articulated manikin test method ISO 15831:2004. Total heat loss requirements were introduced into NFPA 171 in 2000 with the level of stringency being stepped up five years ago from 130W/m² to 205W/m².

Those responsible for the procurement of PPE are looking for a holistic approach from companies such as Hainsworth, which designs its fabrics with a complete understanding of how they interact with the various layers in the system. Serious consideration is given to each layer to ensure that it is providing the highest levels of performance. Three technologies – Titan, Eco-Dry and Advantage – have been developed to offer maximum protection from burn injury, designed to minimise heat stress and provide active moisture management, while also locking in a quality that gives the greatest possible durability.

Hainsworth understands that fully engaging with the end users and becoming partners in the development of the best possible turnout gear is the only way to achieve the world-class standards demanded of manufacturers tasked with the job of ensuring that firefighters return home safely to their families.

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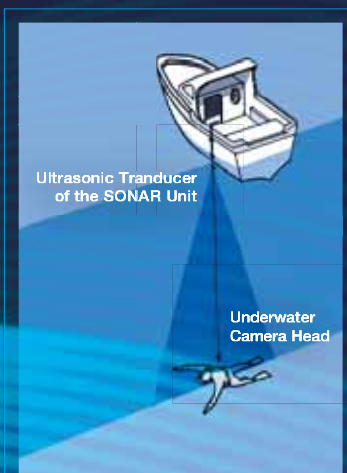
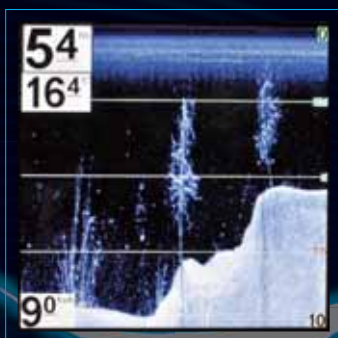
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Ian Dunbar

Holmatro

Structural Collapse Rescue

The term structural collapse is often associated with large scale urban search and rescue operations following natural occurrences such as earthquakes. Indeed the start of this century has seen many high profile natural disasters, which have been well reported across the media, often showing this type of rescue operation being performed by specialist search and rescue (USAR) personnel.

Of course, USAR teams are often a nationally funded resource and are specifically trained in this discipline and respond to any area of the world when required. They take part in regular training sessions and large scale exercises, which allow them to maintain and develop their skills in structural collapse rescue and other areas of USAR operations. As well as learning specific skills, they are also provided with specific tools and equipment, without which, this type of rescue operation would be unsafe and extremely difficult. This kind of equipment is often very different from the equipment used during 'normal' firefighting and rescue operations.

So, if USAR teams have specific skills, equipment and training, what happens when the structural collapse occurs on a more local scale, which does not immediately fall under the jurisdiction of specialised teams?

We must understand that any firefighter/rescuer may attend an incident where structural collapse or instability will have to be managed. This will immediately compromise the safety of everyone on scene and inevitably delay rescue operations. It is also important to remember that structural collapse does not just refer to 'buildings' but relates to any kind of structure that may need controlling in the event where rescue is necessary.

Examples of incidents where structural collapse has to be managed include:

- Transport verses buildings (cars/trucks/aircraft).
- Unsafe structures as a result of gas explosion.
- Unsafe structure as a result of building/renovation.
- Unsafe structure as a result of fire.
- Trench collapse.

In general, the first response to these types of incidents will not include specialist urban search



and rescue teams, so the skills and equipment required may not be immediately available on scene, and the incident progression may be halted due to having to adopt a defensive strategy. It simply is not practical for every rescuer to be specially trained and equipped to deal with structural collapse incidents, however if we accept that attendance at this type of incident is foreseeable, then our preparation must be such, that an effective emergency, response capability can be deployed in the first instance, allowing rescue operations to safely progress.

Transport versus Buildings

In my career I have witnessed many incidents that involved some form of structural collapse or where a structure needs stabilising, so a safe area can be established. By far the most common was when vehicles collide with buildings. In many cases there is a building that needs securing before extrication can take place. Of course there is an option to relocate the vehicle, but this is not sympathetic to the victim, and movement of the vehicle may certainly compound his or her injuries.

Gas Explosions

Gas explosions in domestic and commercial properties are not a rare occurrence and do not always result in a fire. The blast wave exposes the structure to a very rapid dynamic load as a gas explosion will generate high pressures and often also high flow velocities. It is the pressure and flow that cause the dynamic load on structures, and consequently cause the damage. Upon arrival, without the ability to stabilise the structure, there is very little chance of performing effective search and rescue operations.

Building Work

Building and renovation work affect the integrity of a structure, and collapse during this type of work is possible, particularly where work involves load-bearing elements of the structure.

Fire

A building that has suffered severe fire may show signs of collapse. The heat causes thermal expansion of steel beams (in older building these beams may not be protected) and causes brick walls to bulge outwards. All firefighters should be aware of these signs and symptoms of collapse and be able to identify these risks during firefighting operations.

Trench Collapse

Trench collapse operations require rapid intervention due to the nature of injuries that are often sustained. However the stability of the trench will further be compromised by the attendance of rescue personnel at the top of the trench, meaning that rapid stability is required.

None of these types of incidents are rare, and all require some form of structural stability to ensure a safer working environment and to enable the continuation of operations. We have identified that it is not possible for every incident of this type to be attended by USAR specialists as part of the initial response, so what can be done to ensure the gap in knowledge and equipment can be reduced, giving the initial crews a safer working environment and greater options?

Training & Awareness

Building construction is a vast subject and of course differs enormously around the world. However local/regional building methods tend to stay relatively similar (with the exception of new materials, particularly in commercial structures) and this gives a focus for learning.

An understanding of how the load bearing elements within structures work, will give you an appreciation of the consequences when these parts of the building are damaged or completely destroyed. This will also make understand what actions need to be taken in order to rapidly support this area in a dynamic situation.

Understanding the types and severity of injury encountered in such incidents will give you the understanding of the need for dynamic intervention and the control required during extrication. Structural collapse may involve some type of crush injury, also the importance of medical and technical intervention crews working closely in such incidents cannot be underestimated. With crush injury syndrome, immediate release is not an option (depending on the time trapped) and the controlled release of a victim suffering this type of trauma is vital.





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MCH 16 ET COMPACT
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 THREE-PHASE ELECTRIC MOTOR
 CHARGING RATE:
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 DIMENSIONS:
 HEIGHT 88 cm
 WIDTH 92 cm
 DEPTH 61 cm
 DRY WEIGHT: 187 Kg



MCH 16 ET STANDARD
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Identifying USAR teams who may cascade their knowledge is an option worth exploring. USAR specialists will (I am sure) be happy to attend training sessions with firefighters/rescuers in order to assist with your learning.

Your Choice of Equipment

USAR equipment differs from your normal fire-fighting and rescue inventory, however there are some items that offer the possibility of crossover, and for the types of incident listed above, some of the equipment that is normally only carried by specialist USAR teams, should now be part of your primary rescue response.

• Emergency Shoring

This equipment gives you the ability to very quickly construct load bearing shores that can create safe areas in which to work. They are light weight, easy to construct and have both a load bearing and lifting capability. They consist of a strut, extension pieces and together with specifically designed heads and bases, can be used in a wide range of incidents to provide vertical and horizontal stabilisation. The struts can be hydraulic, pneumatic or manual and allow crews who are first on scene to start to stabilise the structure with a view to progressing the rescue. In the case of the hydraulic and pneumatically operated shores, these can be inserted and extended remotely, meaning that the rescuers are not immediately compromised in the risk area.

The main advantage of these types of system is that they are not just suitable for structural collapse/trench rescue incidents, but can also be used for stability or lifting at road traffic collisions, either on single cars or large goods vehicles. So the more exposure you have to using this equipment in more common incidents, like road traffic collisions, the more efficient you are using them at less common structural collapse incidents.

• Concrete Cutters

Removing the results of structural collapse in order to make progress into the building or rescue victims, the ability to crush concrete rather than

cut means there is less noise and dust created. Less dust means the atmosphere is more tolerable and the process of crushing produces little or no vibration at all, therefore not affecting stability.

• Power Wedge

This tool allows the rescuer to commence a lift with an insertion height as little as 6mm. This lift can then be continued with a high pressure lifting bag and a full lift can be realised by the use of a lifting cylinder or a shoring system with a lifting capability. This tool can also be used for breaching security shutters and opening elevator doors.

Conclusion

We must accept that as firefighters/rescuers, we can face a structural collapse incident any day of the week, and it is no longer just the type of incident faced by specialist USAR teams when they respond to a natural disaster on a national or international scale. There are many factors and events that make structures unsafe, and these are not uncommon and indeed are foreseeable.

In most cases, equipment and knowledge may mean that a safe intervention cannot be made immediately and this will inevitably put pressure on the crews on scene, who will be facing the moral pressure to react. Equipment historically only used by specialist teams must now form a part of your initial response package. This allows for a safe environment to be created in the first instance and immediate progression to be made, before the arrival of further resources.

There will always be incidents we respond to where we do not immediately have the right equipment and speciality knowledge. However, the more these incidents occur, the more we must improve our capabilities in terms of what we have and what we know. Whatever we are faced with; crew safety is always the priority. And with additional equipment and training we can ensure that we operate in a safer environment, giving us the ability to be more effective on scene.

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Ian Dunbar is Rescue
Consultant at Holmatro

For further information, go to
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A portable fire extinguisher is, by definition, an item of equipment for the purpose of extinguishing a fire. The reality is however that a portable fire extinguisher is effective only for the type and size of a fire for which it is rated.

Portable fire extinguishers are generally provided as “first attack” units in firefighting and should be used only in the early stages of fire, before the fire grows to a stage that is beyond the capacity of the extinguisher. There are broadly six types of fire extinguisher; Water, Foam, Wet Chemical, Dry Chemical Powder, Vaporising Liquid and Carbon Dioxide. The selection of an extinguisher must be made with the class of fire in mind.

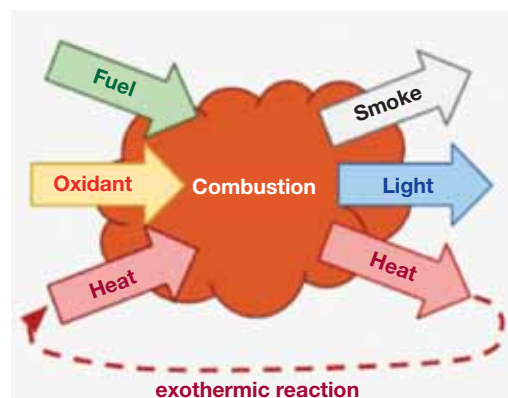
The first record of a fire extinguisher was patent lodged in 1723 by English scientist Ambrose Godfrey. In the following 300 years there have been literally hundreds of iterations and variations on the basic design for a fire extinguisher. If you distil all of the variations you will find five components common to almost every type of extinguisher manufactured throughout history:

- A storage vessel.
- An extinguishing agent.
- A propellant (or expellant).
- A valve.
- A directional nozzle.

Modern fire extinguishers continue to retain these common components; however improvements in technology have resulted in improvements to the performance (capacity and rating) of an extinguisher.

Fire Chemistry

Combustion (fire) is a sequence of exothermic chemical reactions between a fuel and an oxidant accompanied by the by-products of combustion



being; heat, smoke and electromagnetic radiation (light).

There are four elements that contribute to provide the correct environment for a fire to start and be sustained. These four elements are; fuel, heat, oxidant, and the chemical reaction (oxidation). The effective removal of any one of these essential elements will result in the fire being extinguished. In simple terms, a fire extinguisher works by influencing, eliminating or the ongoing effect of one or more of these four elements.

Classification of Fires

Fires are classified according to the type of fuel and if live electrical equipment is present. The classification of a fire is important, as it influences the selection and use of the correct extinguisher required to extinguish a fire. The six classes of fire are:

- Class A – Ordinary combustibles (such as paper, wood and plastics).
- Class B – Flammable and combustible liquids.
- Class C – Flammable gases.
- Class D – Combustible metals.
- Class E – Electrically energised equipment.
- Class F – Cooking oils and fats.

These classes of fire are also illustrated by a pictogram to assist people quickly identify the type of fire.

Types of Fire Extinguisher

As we stated earlier, there are broadly six types of extinguisher; *Water, Foam, Wet Chemical, Dry Chemical Powder, Vaporising Liquid and Carbon Dioxide*. The selection of a fire extinguisher for a given classification of a fire is assisted by the colour coding of extinguishers according to their type.

Portable fire extinguishers are distinguishable by their labels and their colouring. In 1997 the standard colour of portable fire extinguishers changed. From this date, extinguishers supplied to the market are required to be painted red or be polished stainless steel. As this change was relatively recent it is still common to find extinguishers using both Pre-1997 and post-1997 extinguisher colour schemes.

There is no one type of fire extinguisher that is



universally acceptable for all classes of fire. Careful consideration needs to be given to the selection of the most suitable type of fire extinguisher, or combination of fire extinguishers for each application.

Water Extinguishers (W)

A water-based extinguisher also referred to as a stored pressure air-water fire extinguisher is an extinguisher that is filled with water that is stored under pressure (normally by air). These extinguishers are only appropriate for use on Class A fires.

A water extinguisher is effective because it cools the fire, interrupting the exothermic reaction of a self-sustaining fire. This type of extinguisher operates when water, stored under pressure and contained within the extinguisher container is expelled after the valve, operated by a hand-held trigger, is depressed.

Wet Chemical (WC)

Wet Chemical extinguishers are typically installed in commercial kitchens for the protection from Class F fires where the fuel is cooking oils or fats. A wet chemical extinguisher is applied to a fire by forming a soapy foam blanket over the burning oil, smothering it and by cooling the oil below its ignition temperature. The chemical is expelled as a fine mist that does not cause grease to splash onto other surfaces. A wet chemical extinguisher may also be safely used in Class A fires.

Carbon Dioxide (CO₂)

Carbon dioxide fire extinguishers are useful in protecting against fire when an inert, electrically non-conductive, gas is desirable and where clean up from the agent must be minimal. Carbon dioxide extinguishers contain liquid CO₂ that is

There is no one type of fire extinguisher that is universally acceptable for all classes of fire. Careful consideration needs to be given to the selection of the most suitable type of fire extinguisher, or combination of fire extinguishers for each application. Portable fire extinguishers are distinguishable by their labels and their colouring. In 1997 the standard colour of portable fire extinguishers changed. From this date, extinguishers supplied to the market are required to be painted red or be polished stainless steel.

Dry Chemical Powder (DCP)

There are several types of dry chemical powder fire extinguisher; the two main types are:

- ABE Type – Effective on Class, A, B, C & E fires.
- BE Type – Effective on Class B, E & F fires.

Note: Special powders are available to extinguish fires involving Class D combustible metals.

Dry chemical powder fire extinguishers are effective because they interrupt the oxidation process.

Dry-chemical powder is stored under pressure inside the extinguisher cylinder and is expelled when the hand-held trigger valve is depressed.

Air-Foam (AF)

An air-foam extinguisher is applied to either a Class A or B fire as either an aspirated (mixed and expanded with air in a branch pipe) or non-aspirated form to establish a foam blanket or seal over the fuel, preventing oxygen reaching it.

expelled as a gas. Carbon dioxide blankets a fire, because of its heaviness, relative to air. It acts by preventing oxygen from getting to the fire, the result, the burning fuel deprived of the oxygen.

Carbon dioxide extinguishers are effective against Class B and C fires. Unlike other chemicals, CO₂ does not leave a harmful residue and does not adversely affect the environment. It also poses very little danger to electronics and is effectively employed in laboratories, computer rooms, and other areas with sensitive electrical and electronic equipment.

Extinguisher Operation

Fire extinguishers contain an agent that is expelled from the extinguisher to help extinguish a fire.

The agent in each of the extinguishers explained in this document is stored under pressure. The valve is operated when the hand-held

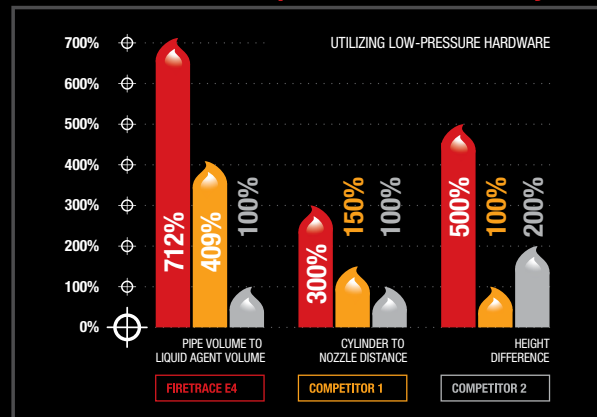
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PORTABLE EXTINGUISHERS

Colour	Agent Type	Class A	Class B	Class C	Class E	Class F	Comments	Class D
	Water	✓	✗	✗	✗	✗	Dangerous if used on flammable liquid, energised electrical equipment and cooking oil/fat fires	Use only special all purpose extinguishers and seek expert advice
	Dry Chemical Powder	ABE ✓ BE ✗	✓	✓	✓	✗	Look carefully at the extinguisher to determine if it is an ABE or BE unit. The capability is different	
	Air Foam	✓	✓	✗	✗	Limited	Dangerous if used on energised electrical equipment	
	Wet Chemical	✓	✗	✗	✗	✓	Dangerous if used on energised electrical equipment	
	Vaporising Liquid	✓	✗	✗	Limited	✓	Check the characteristics of the specific extinguishing agent	
	Carbon Dioxide	Limited	Limited	✗	✗	✓	Not suitable for outdoor use or smouldering deep seated A Class Fires	

trigger is depressed. Some fire extinguishers are also fitted with a pressure gauge that provides a visual indication of the extinguishers pressurised state. Gauges may illustrate a numerical value or a colour-coded pressure range where green illustrates the extinguisher is pressurised and is in a state of readiness.

extinguisher is for the nominated class of fire. When a fire extinguisher is rated for more than one class of fire, it is expressed in alphabetical order, such as 2A:40B:E.

A common misconception is that two fire extinguishers of equal mass (Kg) or volume (litres) have the same rating. Extinguishers are subjected to a

Portable fire extinguishers may be used as the first response to most common classes of fire. In most commercial buildings, they are located throughout a building to provide occupants with the facilities to respond to a fire in its early stages. In domestic buildings, households should be equipped with both a dry chemical powder, Class AB(E) fire extinguisher and a fire blanket.

Extinguisher Rating

Fire extinguishers complying with Australian Standards are marked with a classification and rating, determined in accordance with Australian Standard AS 1850.

Extinguishers are rated by their performance and suitability for a particular class of fire; that is, a typical water extinguisher may be marked 2A and a typical dry chemical extinguisher marked 2A:40B:E. The number before the letter is a measure of the relative performance within the respective class as follows:

- For Class A – Between 0 and 10.
- For Class B – Between 2 and 80.
- For Class F – Between 1 and 4.

The higher the number, the more effective the

range of standardised tests to determine their suitability and rating, in accordance with the requirements of the Building Code of Australia and local authorities having jurisdiction. The rating of a fire extinguisher is required to be prominently displayed on the side of each extinguisher.

Location & Distribution

Generally the Building Code of Australia as well as various state and territory legislation establishes the selection, location and distribution of fire extinguishers used in the community. Australian Standard AS 2444 is generally referenced in whole or in part by these legislative documents and provides further details on the selection, and location of fire extinguishers. AS 2444 is subordinate to

AS1851 MAINTENANCE RECORD														
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	PRESSURE TEST	
12														03
13														04
14														05
15														06
16														08
17														09
18														10
19														11

these legislative documents and care should be taken when providing advice as to extinguisher requirements based solely on AS 2444.

Where required, fire extinguishers should be installed in a conspicuous and readily accessible position, supported by a substantial hook or bracket mounted not more than 1.2 metres above the floor ('hip height'). In addition, portable fire extinguishers should not be located in positions where access could present a hazard to a potential user. Where practicable, they should be located along normal paths of travel and near exits.

Most fire brigades or authorities having jurisdiction have guidelines for the selection and location of portable fire extinguishers to compliment the Building Code of Australia and Australian Standard AS2444.

Sign

There are two basic types of signage associated with portable fire extinguishers: a red, rectangular sign with a white pictorial of a fire extinguisher known as a "location sign" and an optional circular identification disc, specifying contents and type of fire on which the extinguisher is to be used.

• The Location Sign

The location sign should be positioned directly above the fire extinguisher, the bottom edge of which is not less than two metres above the floor. (AS 2444:2001 clause 3.3.4).

• The Identification Sign

The optional identification sign should be placed immediately above the fire extinguisher (below the location sign).

Extinguisher Selection Chart

See previous page.

Using a Fire Extinguisher

After carefully selecting the correct type of fire extinguisher or combination of extinguishers for the right class of fire, a first responder should undertake the following;

- 1 Make sure the area is safe to access, the fire should not be either not too large or too hot, and that there are no other immediate hazards to safety.

- 2 Contact the fire brigade.

- 3 Choose the correct type of fire extinguisher for the class of fire.

- 4 To use the fire extinguisher follow the acronym **PASS** – Pull, Aim, Squeeze, Sweep.

a Pull the pin of the fire extinguisher.

b Aim the extinguisher at the base of the fire.

c Squeeze the handle.

d Sweep it back and forth.

- 5 After the fire has been extinguished it may reignite. If it is safe to do so, secure another fire extinguisher and watch the scene of the fire until the fire brigade arrive.

Maintenance

All portable fire extinguishers are subject to periodic inspection, tests and preventative maintenance activities in accordance with Australian Standard AS1851. This Standard prescribes specific intervals, criteria or events when an extinguisher should be maintained. The frequency of these inspections is recorded on the maintenance record (a yellow tag, securely fixed to the fire extinguisher) by stamping or marking a number to represent the maintenance activity performed as follows:

- 1 – 6-Monthly.
- 2 – Yearly.
- 4 – 5-Yearly.
- 5 – After Use.

As most fire extinguishers are pressure vessels, they may also be required to be discharged, inspected and tested by an approved and licensed facility for any condition that is likely to render the vessel dangerous or unsafe.

Summary

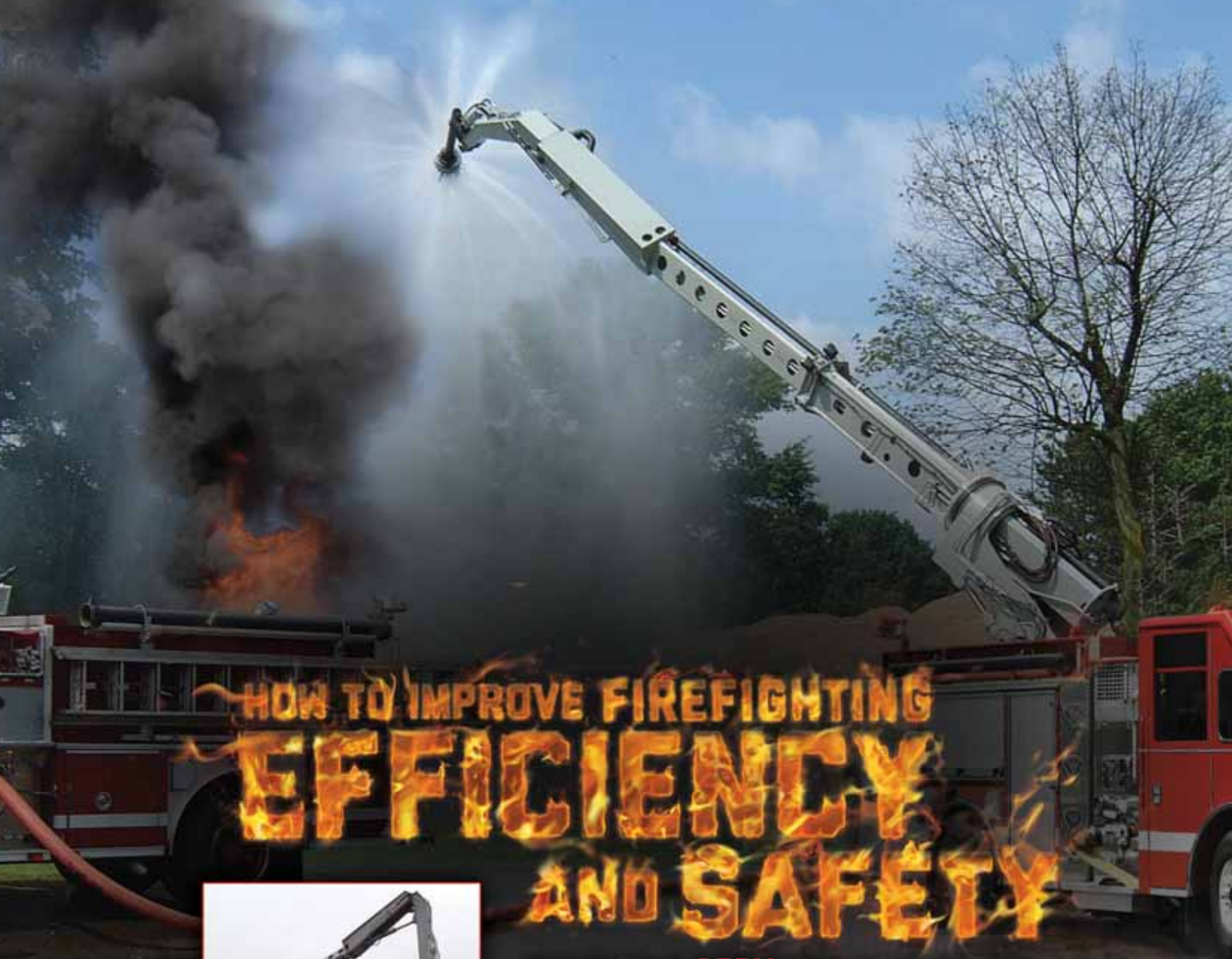
Portable fire extinguishers may be used as the first response to most common classes of fire. In most commercial buildings, they are located throughout a building to provide occupants with the facilities to respond to a fire in its early stages. In domestic buildings, households should be equipped with both a dry chemical powder, Class AB(E) fire extinguisher and a fire blanket.

Fire extinguishers require periodic maintenance and should be maintained in accordance with Australian Standard AS1851.

APF

Russ Porteous is the CEO and one of the founders of Firewize

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Robert Avsec

Battalion Chief (Retired)

Lighting up the Fireground

Scene lighting needs to be a new incident management strategy.

The seven fundamentals of firefighting were first codified by Lloyd Layman back in 1954. Remember these?

- 1** Size-up.
- 2** Call for help.
- 3** Rescue.
- 4** Protect exposures.
- 5** Locate and confine the fire.
- 6** Extinguish the fire.
- 7** Overhaul the fire.

The seven fundamental strategies must occur sequentially while the strategies of salvage and ventilation are implemented anywhere those strategies are needed to support the other seven.

We have now arrived at a point – probably arrived a while ago, but did not fully understand it – where we must add a third parallel strategy: illuminate the scene.

The American National Standards Institute (ANSI) and the Illuminating Engineering Society (IES) are a couple of the organisations that develop information and standards regarding lighting, and workplace lighting in particular. ANSI is a federal agency, while IES is a collegial community dedicated to improving the lighted environment.

The emergency scene is our workplace and it only makes sense that we should view it as such and make it more safe by improving the quality and consistency of our illumination efforts. This also will improve firefighter efficiency and effectiveness. Delivery of the necessary useable light commensurate with the tactical requirements of the incident action plan is the scene illumination benchmark. ANSI and IES define useable light as the minimum level of light necessary to perform a task safely, effectively and efficiently.

By achieving the scene illumination benchmark

PORTABLE LIGHTING

early in the incident, we can have a more positive influence on tactical operations. Here are four areas where proper illumination will influence the scene.

Scene illumination equipment manufacturers are responding to the requirements of today's emergency responders with products that go beyond lights using power cords running back to an apparatus-mounted generator.

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- Improve ongoing assessment of the incident scene.
- Reduce reflex time – the time between arrival of personnel and their engagement in assigned tasks.
- Improve apparatus and equipment positioning.
- Improve tactical operations' execution.

A quick physics refresher is probably helpful before moving forward. Wattage is the measure of the rate of energy conversion or transfer, that is, the power required to operate a fixture or appliance. Lumen is the measure of the total amount of visible light emitted by a source.

According to R.O.M. Lighting Systems, there are two common myths regarding useable light: increase the wattage and you increase the useable light; and increase the lumen rating and you increase the useable light. Both are inaccurate according to the First Law of Thermodynamics. In its simplest form, the First Law of Thermodynamics states that neither matter nor energy can be created or destroyed. Since available wattage is converted to both light and heat during an operation, the only way to increase the amount of useable light from a given wattage is to improve the ability of the fixture or appliance to convert wattage into light rather than heat.

R.O.M. commissioned a third-party test using IES standards comparing its emergency scene lighting equipment to that of its competitors. Not surprisingly, the results reported favoured the R.O.M. products.

According to those results, a 900-watt fixture can deliver more useable light than a 1,500-watt fixture. It does this by reducing the heat build-up in the fixture, using a lens that is 100 percent transparent and using a housing that maximises the outward direction of light energy rather than allowing the housing to absorb that light as heat.

For the fire officer tasked with illuminating the incident scene, the necessary equipment includes – but is certainly not limited to – portable lights, support stands for those lights, electricity supplies, power cords and junction blocks.

Scene illumination equipment manufacturers are responding to the requirements of today's emergency responders with products that go beyond lights using power cords running back to an apparatus-mounted generator. These products are light-weight, portable, and designed for quick deployment anywhere on the emergency scene and extended operating times.

Some of these new free-standing technologies include:

- Pole light combinations powered by rechargeable, 12-volt sealed lead acid batteries using Light Emitting Diode (LED) technology. These units weigh 11.5kg to 13.5kg, can deliver 2,000 lumens and have eight to 15 hours of burn time between charges.
- Tripod-mounted pole light combinations powered by rechargeable Li-ion batteries, weighing 9kg to 13.5kg, and capable of delivering 4,000 lumens. Some of these units have both spot and area-lighting capabilities.
- Generator and light and frame combinations

Illuminating the incident scene should be the third "concurrent incident management strategy" taking its rightful place alongside salvage and ventilation.

upon the weight of the generator – yet capable of delivering more than 20,000 lumens. These units are capable of powering one or two pole lights and have run times of more than 10 hours without refuelling.

The inability to clearly see the incident scene, and properly evaluate that scene for potential risks, has to become one of the primary risks that we address early in the incident lifecycle rather than later.

Illuminating the incident scene should be the third "concurrent incident management strategy" taking its rightful place alongside salvage and ventilation. If we can't see the risk, we can't address the risk.

APF

Robert Avsec is a retired Battalion Chief with the Chesterfield, Virginia Fire & EMS Department

that provide stand-alone units that are still portable – weighing 22.5kg to 32kg depending

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Fred Hildebrandt

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Sustainable Fire Suppression

Modern society relies heavily upon interconnectivity. The word infrastructure is no longer restricted to traditional means of conveyance such as roads. When used in 2014 vernacular it typically refers to networks that keep our interconnected society moving at a rapid pace.

In a recent *Information Age* discussion, the cost of data loss through a security breach was said to average US\$860,273.00. Considering this fact, if the equipment for storing, processing, and transmitting this data were impaired or destroyed by fire, one can assume costs would escalate dramatically. The equipment that ensures successful completion of transactions sits in modern citadels, loosely referred to as data centres, telecom facilities, server sites, and colocation sites situated in facilities in virtually every community. IT professionals are keenly attuned to actions taken by intruders hacking into their prized networks. Faced with those risks, CIOs and IT professionals sometimes relegate the risk of fire to a lower priority. That fact, coupled with the wide range of available products could lead to them delaying the fire protection decision rather than making what they perceive to be the wrong choice. However, the fire protection industry offers a variety of solutions based specifically on the needs of our modern IT sector.

It is important to recognise that all clean agent fire protection options share the following attributes:

- Safe for human interaction.
- Three dimensional.
- Quick-acting fire extinguishment, in some cases within seconds.
- Does not leave residue upon discharge.
- Electrically non-conductive.
- Global availability.
- Tested and approved by globally recognised testing agencies using accepted standards.

Typically, systems utilising Clean Agents as described in NFPA 2001-2012 edition fall into the following three categories (see table).

Comparison of Inert Gases, Halocarbons & Perfluorinated Ketones

The higher volumetric concentration requirements of inert gas agents, along with the differing physi-



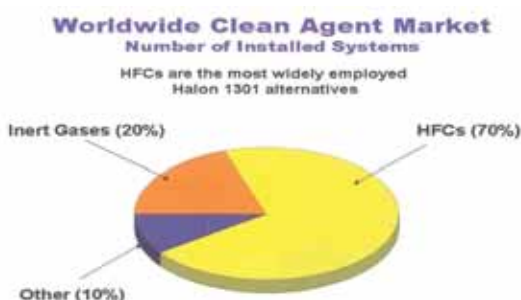
cal properties of the inert gases compared with the halocarbon and perfluorinated ketone agents has a significant impact on system design and cost. The inert gas agents cannot be compressed to the liquid state (at normal handling temperatures), and must be stored as a gas. In order to store the gases efficiently they must be compressed to much higher pressures, which necessitate the use of high pressure storage cylinders, adding cost to inert gas suppression systems. The low volumetric efficiency of the inert gas agents and their inability to be stored as liquids requires a larger number of cylinders compared with other clean agent systems. This requires additional storage space and an increased system footprint.

In contrast to the inert gas systems, the halogenated and perfluorinated ketone agents can be stored as liquids, allowing for a much larger mass of agent to be stored in the same volume compared to

	Designation	Chemical Formula	Trade Name	Manufacturer
HFC's	HFC-227ea	CF ₃ CHFCF ₃	FM-200®	DuPont
Inert Gases	IG-541	N ₂ (52%) Ar (40%) CO ₂ (8%)	Inergen®	Ansul
	IG-55	N ₂ (50%), Ar (50%)	Argonite™ Proinert®	Ginge-Kerr Fike Corp.
	IG-01	Ar	Argotec	Minimax
	IG-100	N ₂	NN100	Koatsu
Perfluorinated Ketone	FK-5-1-12	CF ₃ CF ₂ C(O)CF(CF ₃) ₂	Novec™-1230	3M

inert gases. This significantly reduces the required number of cylinders. In addition the most widely used halocarbon and perfluorinated ketone agents can be stored in light wall low pressure cylinders and employ standard schedule 40 or equal steel pipe. Typical pressures of inert gas systems are 150 bar, 200 bar, and 300 bar, whereas halogenated and perfluorinated ketone agents are typically stored in welded seam cylinders pressurized with nitrogen to 25 bar and 35 bar, spun steel cylinders are utilized for 42 bar or 50 bar systems.

For Class A, Class B, and Class C hazards the choice between an inert gas or halogenated and perfluorinated ketone agent typically involves the owner/customer, specifying engineer, authority having jurisdiction, fire protection supplier or collaboration between all parties. Where Class D hazards are involved, specific inert gases become the only choice for a total flooding agent.



In an effort to be as concise as possible, we have limited our references to the most widely used products: HFC 227ea (FM-200), inert gases and perfluorinated ketone FK-5-1-12 (Novec 1230 fluid).

HFC 227ea (FM-200) Systems

HFC 227ea (FM-200) was one of the first in a series of agents to be accepted by the U.S. EPA (Environmental Protection Agency) Significant New Alternatives Program, as a replacement for Halon 1301 in total flooding applications, and has been installed widely around the world. Fire extinguishment occurs by heat absorption removing enough heat so that the fire can no longer sustain itself. The safety factor between design concentration and LOAEL (Lowest Observable Adverse Effect Level) is 36 percent. Spot market shortages were experienced in 2012 but have been rectified and the supply of equipment and agent for new systems or recharge is currently available globally.

Environmental regulations have increased costs in some regions but it is important to recognise that contributions to climate change from HFC's in fire extinguishing applications is less than 0.01 percent based upon data from the U.S. EPA and EU-15 Countries. Regulatory bodies have been treating HFC's in fire suppression differently than other applications where those in other industry segments, such as refrigeration, dwarf fire suppression emissions. The F-Gas regulation in Europe has adopted, supported and regulated good industry practices around filling, recharging and servicing fire extinguishing systems equipment.

Inert Gas Systems

Inert Gas systems utilise a single gas or blends of gases to affect fire extinguishment, largely due to removal of heat and oxygen reduction. Gas blends assist in the retention of agent in the protected space by approximating the density of breathing air. Specific egress and exposure times must be

followed depending upon the minimum system design concentration.

The majority of systems use an orifice plate to reduce the high storage pressure of the gas to a more suitable pressure for the piping network. Pressures upstream of the main orifice are extremely high and will typically require the use of high strength materials. The manufacturer's piping guidelines must be followed to ensure safe operation of the system. Recent cylinder valve designs regulate the flow of gas at the cylinder allowing the wider use of standard wall piping in the system.

Once again the manufacturer's guidelines must be followed. Space allocation and overall weight of cylinders is a key consideration when installing an inert gas system. If the protected space is modified, a reduction of the volume could be detrimental to the life safety due to increase of the volumetric concentration of the agent and must be reviewed by a competent fire protection professional; in addition, room pressure venting must also be provided when using any inert gas even with revisions of discharge times as outlined in paragraph 5.7.1.2.2 of NFPA 2001, 2012 edition.

Novec 1230 Fire Protection Fluid

The latest entrant into the global clean agent fire extinguishing systems market is FK-5-1-12 (Novec 1230). This product extinguishes fire primarily by heat absorption and has garnered wide global acceptance as it has the highest safety factor between design concentration and Lowest Observable Adverse Effect Level, 67 percent to 122 percent based upon hazard classification. 3M has increased manufacturing capacity to assure adequate supplies for new systems or recharges of existing systems. It has an extremely low Global Warming Potential of 1, very low atmospheric lifetime of five days and is included in the EPA Significant New Alternatives Program approved for total flooding systems 12/20/02.

Novec 1230 [FK-5-1-12] is unique in that its vapour pressure is very low at ambient temperatures. This gives the system designer an opportunity to consider use of higher nitrogen pressures when using light wall welded seam cylinders designed to U.S. Department of Transportation standards up to nominal 34bar pressure (systems employing pressures higher than 34bar nominal may require the use of higher rated pressure cylinder). This increased nitrogen pressure and updated hydraulic calculations dramatically improves the flow of agent in piping networks associated with clean agent fire extinguishing systems. Standard wall pipe and fittings are typically used to install the systems in accordance with the manufacturer's design manuals.

Clean agent fire protection dates back to 1947 when the U.S. Army sponsored research at Purdue University in West Lafayette, Indiana to develop an extinguishing agent with low toxicity and high fire extinguishing effectiveness. That research led to the commercialisation of Halon 1301, the production of which ceased as part of the Montreal Protocol; however, it is important to recognise that civil and military aircraft continue to rely on Halon 1301 systems in engine nacelles, cargo bays and lavatory waste bins. It is highly unlikely that even those far-sighted professionals could imagine the ways we use data in our daily lives. And yet their research provides the vision we must continue to embrace when protecting the high value assets that form the backbone of our interconnected society. **APF**

Fred Hildebrandt is Director of Sales at Janus Fire Systems

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Fire & Weather – U the Extremes

This Bushfire CRC research investigated complex weather interactions with fire. Photograph courtesy CFA Communities and Communication



Nathan Maddock

Bushfire CRC



Hot temperatures, high winds and low humidity are important factors in bushfire behaviour. Predicting these complex weather interactions was the goal of a Bushfire CRC project led by the Bureau of Meteorology.

Destructive bushfires are synonymous with spotting. Embers, such as flaming pieces of bark, are carried on the wind ahead of the main fire, resulting in a fire travelling a long way in a short amount of time. This can potentially catch firefighters and the community off guard. But what sort of weather leads to this extreme and complex fire behaviour? Dr Jeff Kepert, Bushfire CRC project leader and head of high impact weather at the Bureau of Meteorology in Australia, led the research.

Computer modelling has become an essential element of modern weather forecasting. In 2009, the Bureau of Meteorology upgraded to a new modelling system, the Australian Community Climate and Earth Simulation System (ACCESS). It has brought a large improvement in forecast performance.

As part of Bushfire CRC research, Dr Kepert and his team used ACCESS to help understand how bushfires interact with weather. This research mode uses extraordinary computer power to perform very high resolution simulations, with detail more than ten times finer than are used operationally. "But it takes a lot of computer time," noted Dr Kepert. "A one-hour simulation will take the computer two hours to process." These speeds cannot be run operationally, in day-to-day weather forecasts. "Time constraints make this impossible," said Dr Kepert. He continued: "But what it does is let us drill-down and really see fine

details of what is happening in the atmosphere. As a result, we can better understand how these fine-scale features may interact with bushfires and how this may affect the spread and intensity of bushfires."

A particular focus of the research simulations is spotting and ember transport. The team ran simulations of the weather experienced in Victoria on Black Saturday in 2009 to understand the conditions experienced, and to see just how far ahead of the main fire front spotting could occur.

He explained: "At the moment we have real difficulty in predicting how far embers are going to be transported. There is an enormous amount of uncertainty. We do not know how high they can be lifted. As you go up in the atmosphere, the horizontal wind speed varies, as does the direction. You need to know how high the embers are going to be lifted to be able to predict which direction they are going to go in, and how far. To travel large distances, such as 30 kilometres, embers need to be suspended in the atmosphere. To travel this far they would probably have to be suspended and burning for 20 or 30 minutes. This implies that the embers are quite large. It also implies that the updrafts in the atmosphere have to be quite strong."

The research shows that these updrafts are a key factor in extreme and complex fire behaviour. "An updraft is buoyant hot air, which is caused by a number of things. The first is the fire itself. The

Understanding

smoke column from a fire is hot, and therefore ascends,” explained Dr Kepert. Anyone who has sat around a campfire would have seen embers suspended on a small scale.

“Our simulation shows that in extreme conditions, the updraft above a large fire exceeds 70 kilometres an hour. This is enough to lift and suspend quite large embers. But an updraft caused by a smoke plume weakens with height, particularly on windy days. It can become very erratic.”

The research indicates that smoke plumes may be unlikely to be able to transport embers long distances in isolation. Spotting in the tens of kilometres requires more than a smoke plume. Its interactions with atmospheric features are important. One of these factors is roll vortices. Again, Dr Kepert explained: “To understand what a roll vortex is, imagine standing with your back to the wind, looking downwind. If you could see roll vortices, what you would see is pairs of counter-rotating rolls, a little bit like endless pairs of egg beaters, one after the other, alternating between rotating clockwise and anticlockwise.”

Between each pair of rolls is either an updraft or a downdraft. Dr Kepert noted that the simulations of Black Saturday showed the lowest four kilometres of the atmosphere was filled with roll vortices, with the associated updrafts peaking at speeds of 20 kilometres an hour, enough to suspend embers such as large pieces of bark. The updrafts are relatively narrow, whereas the downdrafts are broad.

“This means the updrafts really concentrate the air and can support the embers as they are carried downwind,” said Dr Kepert. “The simulations also show these updrafts are weaker closer to the ground. As a result, we do not think the roll updrafts can lift embers by themselves; there is an interaction between the smoke plume, which lifts the embers up to a height of a kilometre or so, and then the roll vortices manage to suspend the embers further, contributing to the long-range spotting.”

A wind change is a crucial time in fighting a fire. Eye-witnesses often talk about very intense spotting when a wind change occurs. The research has also simulated this.

Dr Kepert explained that a wind change can also produce a strong updraft, but unlike roll vortices, a wind change can also produce a strong updraft during the night, not just the day. “Wind changes – cold fronts and sea breezes, meteorologists have known for a long time that right at the head of the wind change there is a narrow region of strong updraft. What is not understood is whether this updraft has a role in promoting spotting during a wind change. But we suspect that it does. On Black Saturday, the Beechworth–Mudgegonga fire produced an intense burst of spotting that threatened the nearby town of Myrtleford, a few kilometres away. This happened near midnight, when the fire would normally be less active. It seems that the wind change impacting the fire was responsible.”



Dr Jeff Kepert presenting his research into extreme fire weather at the 2012 AFAC and Bushfire CRC conference in Perth

The research investigated these factors. Results show the updraft on the wind change is strong enough to suspend embers, so it is believed that in conjunction with the fire plume, it may result in an increase in spotting. But more research is needed to completely understand how this occurs, and why.

The aim of the research is to help predict which bushfires are most likely to produce significant spotting, and when. As understanding of the physical mechanisms that lead to spotting increases, the ability to be able to predict it better will increase. “With this knowledge, fire agencies will be better able to warn communities. It will also assist fire agencies to be quick off the mark and onto the scene when a spot fire occurs, to get on top of it before it becomes too large to manage.”

There is still a long way to go. “To predict things explicitly, we are still some years away,” concluded Dr Kepert. “But through running these very high resolution research models, we are able to take knowledge and understanding to coarser resolution models that we can run in real-time, on a day-to-day basis. We can interpret what we are seeing with the current operational speeds in light of what we know from the high resolution, and make useful predictions.”

Research such as this, along with more powerful computers and increases in satellite technology, have led to improved weather forecasts in recent years. Compared to Ash Wednesday in 1983, weather forecasts can now provide the community and emergency services with more accurate warnings of extreme weather, much earlier.

The research undertaken by Dr Kepert and his team was part of a collaborative Bushfire CRC project *Risk Assessment and Decision Making*, which incorporated researchers from Geoscience Australia, CSIRO, the University of Melbourne and the Bureau of Meteorology. The collaboration developed a proof of concept software program that can show the probability of a fire impacting specific areas, taking into account variable factors like changes to humidity, temperature, wind speed and direction.

APF

Dr Jeff Kepert is Bushfire CRC project leader and head of high impact weather at the Bureau of Meteorology in Australia

For further information, go to www.bushfirecrc.com



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Airport Design and Glazing Systems



Lee Coates

Wrightstyle



Worldwide, Kenya has been much in the news recently, and not for the right reasons. The Westgate shopping mall massacre in which at least 67 people died is a shocking reminder that any building where large numbers of people gather can be a terrorist target.

That threat is most real at airports, which can have a pivotal role in regional or national economies and, for the terrorists, significant news value. Airports have therefore seen the greatest investment in security and building research, although the recent Westgate attack is a reminder that the threat is much wider. Nor is the threat confined to larger hub airports. The 2007 attack at Glasgow airport underlines how terrorism can be national or local, meticulously planned for maximum effect, or simply opportunistic.

But it would be simplistic to consider airport security purely in terms of terrorist threat. In August last year, Kenya was again in the world's media spotlight following a major fire at Nairobi's Jomo Kenyatta airport, the busiest in East Africa, and of major economic importance for the country – both for inward tourism and exports, mainly cut flowers.

The catastrophic fire, most probably started by faulty wiring, demonstrates how a major infrastructure asset can quickly become a national liability. The airport, built in an age before modern fire regulations and protective systems, was extensively damaged – the blaze gutted the arrivals terminal – closing off a vital transport gateway. However, perhaps remarkably, there were no casualties.

The Nairobi fire is a stark reminder of the importance of identifying every conceivable threat, that strategies to deal with them are robustly examined, and emergency procedures routinely tested – which was not the case in Nairobi with its aged infrastructure, inadequate emergency equipment and poor response planning. However, Boston airport last year had to apologise for holding an emergency training exercise on 9/11. A week later there was a fuel pump fire at the airport.

Countering these threats starts with a comprehensive assessment of the likely (or unlikely) risks the airport might face in terms of an accidental or deliberate interruption to its operations. Modern building safety is largely determined by taking a multi-disciplinary approach to assessing these hazards – from power failure to cyber-attack, from civil disorder to fire and explosive detonation.

Assessment involves reviewing the architectural design of the all airport infrastructure, establishing fire safety objectives, identifying fire hazards and examining all possible emergency situations. In an airport, with its unique security profile, that includes creating specific evacuation zones to prevent occupants passing from landside to airside, or vice versa, without necessarily evacuating the entire terminal.

d the Role of

In that respect, airports are much like shopping centres: a large outer structure, into which are dropped functional areas – everything from airport and airline administration to security and baggage handling, and onto retail and food and beverage outlets. Visit any modern airport and parallels with shopping centres are plain.

Like shopping centres, airports can be filled with people of different nationalities, with young families, and of varying age and mobility. However, making evacuation models harder to predict, many of those occupants will also have large amounts of luggage. In the event of an emergency – particularly at peak periods – evacuation times may be greater than predicted, and, and evacuation routes and exists must be designed to cope.

For an airport, other factors might have to be considered – from the kinds of threat specific to that country or region, to the airlines that make use of the facility. For example, a 1985 bomb explosion at Tokyo's Narita airport killed two baggage handlers. The bomb had been destined for an Air India flight and had exploded prematurely. Less than an hour later another Air India flight exploded in mid-air off the west coast of Ireland killing all 329 people on board.

There are a number of assessment methodologies to understand the potential threats, identify

using rocket launchers, suicide vests and small arms.

That, in essence, is the airport designer's conundrum: how to build a facility able to safely handle large numbers of people, while making their experience as hassle-free as possible. Official guidance now covers all of an airport's critical functions, from security checks on passengers to aircraft hold baggage, from the location of car parks to the glazed elements in the building's design. The guidance also includes the design of areas immediately outside terminal buildings to create an exclusion zone for unauthorized vehicles.

Stand-off distance is an important consideration. A bomb detonating at seven metres from the terminal façade will, depending on the size of the bomb and type of explosive, generate blast pressure of up to one ton per square foot. At 30 metres, blast pressure falls to one-tenth of a ton per square foot – within building regulation parameters on structural integrity.

Modern building design, in airports as elsewhere, now makes extensive use of glass. It brings in ambient light and creates a more pleasant interior environment. Interestingly, a survey last year found that London Luton airport has the lowest passenger satisfaction of any UK airport – a facility that many considered gloomy, and which is one of the oldest terminals in the UK.

Airports can be filled with people of different nationalities, with young families, and of varying age and mobility. Many will also have large amounts of luggage so, in the event of an emergency – particularly at peak periods – evacuation times may be greater than predicted, and, and evacuation routes and exists must be designed to cope.

the assets to be protected, and how best to mitigate against those risks. That assessment then guides the design team in determining acceptable risks and the cost-effectiveness of the measures proposed, both airside and landside.

That was brought home in the UK when Irish terrorists fired mortar bombs onto the runway at London Heathrow in 1994. They failed to detonate but underlined how airport security is an issue that has to be considered outside, not just inside, the airport's perimeter.

The same tactic was used four years later in 1998 when left-wing terrorists fired projectiles into a cargo area of Tokyo Narita airport, injuring an airport worker. The attack came at a time of heightened security, with athletes and officials gathering for the Nagano Winter Olympics. The airport also saw a firebomb attack on its control tower two months before its official opening in 1978.

Another attack from outside the perimeter took place in 2012 on Bacha Khan International Airport in Peshawar, Pakistan, causing multiple fatalities. The Taliban attackers first detonated a car bomb against the perimeter before mounting their main assault

The extensive use of glass has come about as a result of investment in innovation, both to develop new laminated glass types and framing systems able to withstand blast pressure, as well as to accurately evaluate those systems using a variety of assessment and computational tools.

Wrightstyle has gone beyond computational assessment to also conduct live bomb testing. One test involved a simulated lorry bomb attack (500 kg of TNT-equivalent explosive) detonated 75 metres from the test rig, followed by a simulated car bomb attack on the same glazing system (100 kg of explosive), detonated at a distance of 20 metres. Both tests were equally successful.

As recent events in Kenya have shown, both fire and terrorist attack are potent threats to be assessed, comprehensively guarded against, and with regular rehearsals to ensure that response teams can deal adequately with any emergency.

That multi-dimensional approach also extends across the built environment, developing next-generation products and systems to ensure new levels of fire and terrorist protection. The specialist glass and glazing industry remains at the forefront of that innovative research process.

APF

Lee Coates is Technical Director at Wrightstyle

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The Sound of Safety



Graham Collins

A critical factor in the quest to achieve fire safety is an effective fire safety strategy, and an essential component of this is a strategy for the safe evacuation of the building. Voice alarm systems have been around for the best part of a couple of decades, and there is strong evidence to support the argument that their ability to deliver clear and unambiguous voice messages improves response times, ensures that the safest emergency exit routes are used and achieves an appropriate response to any emergency.

As buildings – and in particular public event arenas, shopping malls, superstores and high-rise commercial, residential and mixed-use structures – become more complex, the ability to control and manage the movement of people to safely in an emergency has become ever more challenging. Raising an alarm can cause members of the public in particular to panic and potentially behave in ways that may jeopardise their own or others safety. However a voice instruction, or series of instructions, tailored to the specific risk and communicating the most appropriate actions to be taken, delivered in a calm and concise manner can reassure them and

give clear instructions on what to do.

A spoken message identifies the nature of the problem and gives specific and detailed information to the public. It provides real-time information, giving exact instructions to people who may not be familiar with the surroundings, while also improving management of the evacuation. This may be to exit all areas of the building, to conduct a planned phased evacuation of the building or, in some circumstances, simply to remain in place.

There is ample evidence to show that spoken instructions significantly reduce the time taken to evacuate a building after a fire alarm has been activated, particularly by visitors, delegates or

VOICE ALARMS & EVACUATION



customers who are almost certainly unaware of the building's fire and emergency procedures. This is supported by a growing body of research that validates the argument that voice messages result in shorter and more reliable pre-movement times in an emergency than a sounder system. This research also indicates that the use of shorter messages helps to reduce the pre-movement times still further.

A voice alarm system also overcomes the problem of different countries using different alarm tones, as there is no universally accepted fire alarm tone across the Asia Pacific region. While a buzzer

or bell might be the same in every "language", there is no way in which its meaning can be instantly conveyed if the building's occupants are from many different countries and cultures.

Human Behaviour

Human behaviour is a major consideration when addressing the evacuation challenge, so it is important to appreciate the likely actions people will take in a fire to ensure their safety.

Language is important. In Australia, for example, while English is regarded as the national language, as many as 15 percent of the population – around four million people – are believed to speak a language other than English at home. These include Italian, Greek, Cantonese, Arabic and Vietnamese. So a message broadcast only in English may be not only meaningless, it may add to the confusion or panic and be of little more use than a traditional alarm sounder. An option in these circumstances is to broadcast in several languages, one after the other.

Other studies have shown that there is often a high propensity to ignore conventional sounders, that without fairly precise warnings some people will assume that the fire is only a minor event, plus there is a strong universal tendency for people to strive to exit a building via a familiar escape route or the route they took when entering the building, which may unknowingly put them at greater risk. In shopping malls, for instance, being with family members may influence escape behaviour and hence the overall escape time.

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Another human behaviour factor that has been thrown up by research is the time it takes from an alarm bell sounding, for the occupants to actually do anything regarding their escape. It has been discovered that pre-movement time can be significant; indeed in some instances, more significant than the distance that would have to be travelled to a safe exit.

Evacuation

In all probability, when assessing the evacuation strategy it may not be possible to make structural changes – such as providing additional exits – to an existing building, particularly in the case of high-rise structures.

While architects endeavour to limit the distances that will have to be travelled to an exit, as a method of limiting the time to escape, it is often assumed that the travel time will form the largest part of the time taken to evacuate the building; which is not always the case. Studies have shown that the pre-movement time referred to earlier can be a significant portion of the total evacuation time; alarmingly, in many cases it can be longer than the travel time. Put simply, people stand around trying to decide what the alarm means and whether it is directed at them, pondering what to do and looking around to see what others are doing.

These pre-movement times have been assessed for a number of different structures and the conclusions are that they can account for up to a staggering 80 percent of the evacuation time. The ability to reduce this pre-movement time with clear and incisive messages can therefore significantly reduce the total evacuation time and is a major benefit that comes with installing a voice alarm system.

Stay in Place

Not that the most appropriate action is always to exit the building; there may be instances where moving to another part of the building or not using particular exits are the safest options. Providing this sort of information is all but impossible with anything other than a voice alarm.

For example, today terrorist threats are all too common and simply sounding a conventional fire alarm can have disastrous consequences by moving people into danger instead of away from it. Indeed,



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voice communication is vital in terrorist threats as it is difficult to contain areas without this type of system. This is particularly so if the emergency is suspected to involve a so-called “dirty” bomb. In addition to instructing occupants to remain where they are as there is the risk of further detonations outside the building, a voice alarm can also remind people to stay away from windows or evacuate only via an exit away from the danger area.

Voice Alarms

There is plenty of evidence to demonstrate that voice messages are far more effective than bells, buzzers or beacons alone and that in an emergency the public take more notice of spoken words than fire alarm sounders. Independent research has revealed that only 13 percent of people react in a timely manner to bells in contrast with 75 percent who react quickly to a voice message explaining the nature of the emergency.

A voice alarm system can be used for live speech as well as recorded messages; it is a zoned system, and can be used to broadcast timely announcements, along with the option to broadcast background music. The level of manual control offered by the system and the need for live messages as opposed to automated messages is at the heart of the decision on the type of system selected. Another valuable feature is the ability to broadcast “coded” messages that have fire and emergency meaning only to key staff, security personnel and fire wardens.

There are currently a number of variants of voice alarm systems on the market that, generally at least, can be categorised as standalone voice sounders, central rack amplifier systems and distributed amplifier systems. The factors to be taken into account when selecting a particular type of system include the type and size of building and the evacuation requirements, considering such factors as whether or not the building and/or its use or occupancy necessitates phased evacuation or “all out” evacuation.

As was discussed earlier, evacuation from large

public buildings can often be very complicated, with any number of fire exits and haphazard signage that can so easily lead to panic and as hundreds – possibly thousands – of people attempt to exit the building. In such situations, a voice alarm system can be installed to deliver appropriate messages that are relevant in different parts of the building. It can, for instance, direct people to the nearest safe exit, instruct them not to use lifts, or advise them to remain where they are as they are not at risk.

Cost is a frequently cited reason for not installing a voice alarm system. However, these cost challenges can be overcome by opting for a voice sounder system, which is lower in cost than a voice alarm system, yet provides more information than a conventional sounder. Such systems are not designed to suit every type of building – they cannot be used for live speech, or to broadcast non-emergency information – and are more appropriate for smaller structures, such as small shops and offices with low ambient noise levels. They automatically play a voice message when the system operates and so are generally easier to install.

Most voice alarm system manufacturers offer the option for bespoke messages, allowing the end user to create their own audio files to be uploaded into the voice sounders. Depending on the system chosen, this may be programmed at the production stage or be manually uploaded by the system user.

Building Design Considerations

Whichever voice alarm manufacturer or system is chosen, its design, citing and installation are of critical importance.

Acoustic performance is an area that requires particular attention, as anyone who has struggled to comprehend announcements in supermarkets and railway station all affirm. It is a field requiring expert guidance for, while a typical commercial building may present few acoustic challenges, the same cannot be said for a shopping mall with atria, or a semi-enclosed stadium. For this reason, on new-build projects, it is often advisable to involve the chosen system supplier/installer at the building design stage, as even floor and wall coverings can make a significant difference to the room’s acoustic characteristics.

Large open structures are likely to reverberate and echo and so the intelligibility of a voice sounder will deteriorate over distance, making it important for multiple voice sounders in the same space to be kept in synchronisation. The shape of the room in which the sounder is installed, any background noise present during the time of an emergency, and a system’s synchronicity all affect the intelligibility of the voice message. Another challenge for the designer of the installation is potential problems with what is known as the “spill over” of sound from one area to another that could create confusion.

Clearly, it is vital that everyone in the building can hear and understand the alarm and know precisely what they should do to exit the building. Occupants need to be able to understand the message, but a loud and distinct message does not mean it will necessarily be understood. Achieving this depends, in large part, on the skillfulness of the installation design and loudspeaker system and the system’s acoustic performance.

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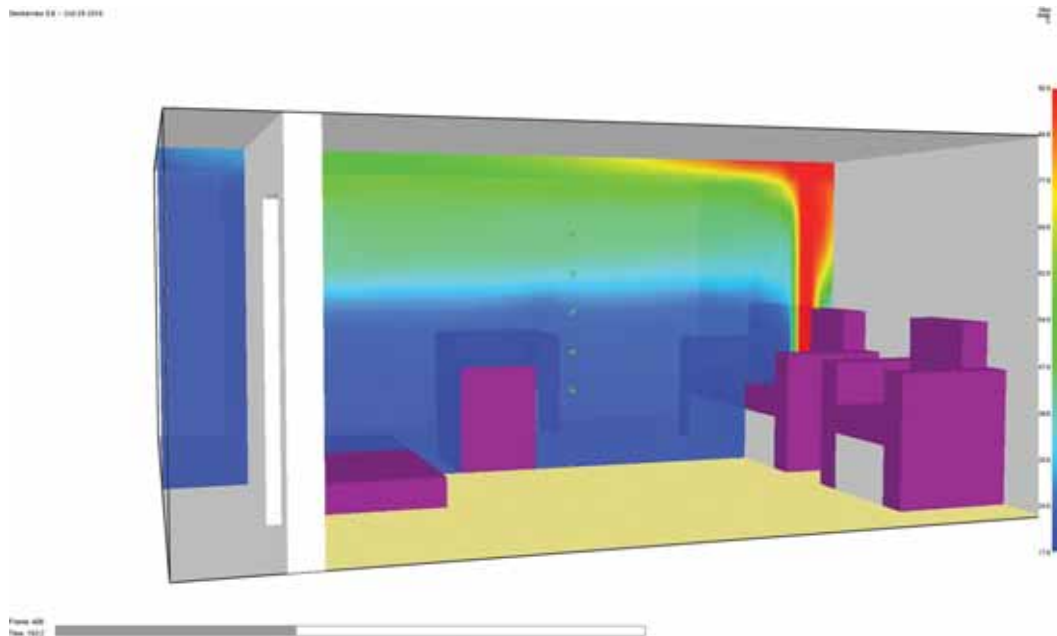


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Comparing Low-Pressure Water Mist and Sprinklers



**Marijan
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Although stable systems for fire extinguishing with water mist have been known for decades, they were not used in south-east Europe until recently. In the past few years, several companies have engaged in designing and installing stable water mist systems, whereby finely dispersed droplets of water use physical properties more efficiently than conventional sprinkler systems. The water passes through special nozzles at a high working pressure and is atomised to sizes up to 1,000 microns. Due to the extremely small amount of water that is used, the potential for damage from water during fire is reduced to a minimum.

In this article I will deal with the difference between classic sprinkler systems and water mist systems using Computational fluid dynamics – usually abbreviated as CFD – a branch of fluid mechanics that uses numerical methods and algorithms to solve and analyse problems involving fluid flow. Computers are used to perform the calculations required to simulate the interaction of liquids and gases inside a defined area. The basis of almost all CFD models are the Navier-Stokes partial differential equations, which define any single-phase fluid flow.

For the purpose of this research Fire Dynamics Simulator (FDS) was used with the addition of the commercial version (2012) of the Pyrosim graphical interface (created by Thunderhead Engineering), developed for post-processing of the results obtained by modelling the FDS.

FDS models can predict smoke, temperature, carbon monoxide and other substances during the fire. Simulation results are used to verify the safety of the building before construction, evaluate the security options of existing buildings, carry out the reconstruction of fire during the investigation of

fire causes and assist in the training of firefighters. Pyrosim interface provides immediate feedback and ensures proper form for FDS output file. Both examples in this research are basically modified examples that come with PyroSim.

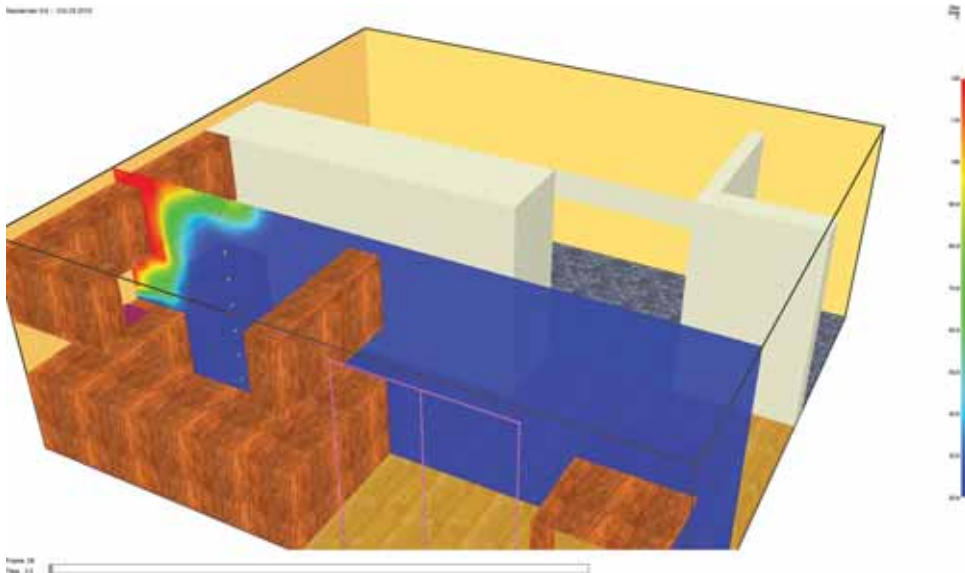
Example One: The Living Room

Example One is a model of the development of a fire in a room that simulates a living room. The room dimensions are 5.2 metres by 4.6 metres by 2.4 metres high and its volume is 75.4 cubic metres. The whole unit is defined with a mesh structure consisting of a ten centimetre cell size and the total number of cells being 67,392. The source of the fire is on the central part of the sofa, and the heat release rate per area is 1000 kW/m². Above the sofa is a classic sprinkler nozzle, while in the second situation the classic sprinkler is replaced with a water mist nozzle. Simulation time is 400 seconds.

The sprinkler has the following specification:

- Activation temperature of the nozzle: 74°C.
- Droplet speed: 5 m/s.
- Number of droplets in one second: 5,000.
- Droplet diameter: 4,000 µm (4 mm).

Pressure Water Mist



The water mist nozzle has the following specification:

- Activation temperature of the nozzle: 74°C.
- Operating pressure: 11 bar.
- Number of droplets in one second: 384,000.
- Droplet diameter: 500 µm.

In this example, both nozzles were activated after 165 seconds from the start of the fire, which was expected because in both cases the activation temperature was the same. In the case of the sprinkler the temperature gradually fell from 97.5°C to 65°C. After 200 seconds from the start of the fire, the temperature above the sofa decreased to approximately 70°C. The sprinkler successfully lowered the temperature and prevented further spread of the fire, but did not completely extinguish the fire on the sofa. Only a few seconds after the activation of the water mist nozzle, the temperature was lowered from 89.5°C to 45°C. After 200 seconds from the start of the fire, throughout the room the temperature dropped to 25°C. The water mist nozzle completely extinguished the fire in the room and lowered the overall temperature to 25°C.

Example Two: The Kitchen

Example Two is a model of development of a fire in a room that simulates a kitchen. The room dimensions are 6.4 metres by 4 metres by 2.4 metres high and volume is 61.44 cubic metres. The whole unit is defined with the same size mesh as Example One, and the total number of cells is 245,760. In the middle of the kitchen is an installed classic sprinkler nozzle in the first case and, in the second, this is replaced by a water mist nozzle. Both nozzles have the same specifications as in the Example One. The source of the fire is set on top of one of the kitchen's cabinets, simulating fire from cooking stove. Simulation time is 400 seconds.

Both nozzles activated three seconds after the start of the fire. In the case of sprinkler the temperature was maintained between 80°C and 90°C until the end of the simulation. The sprinkler did not

lower room temperature under 80°C, but it prevented further spread of the fire in the given time. After activating, the water mist nozzle temperature was lowered from 74°C to 40°C. 30 seconds later the room temperature varied between 25°C and 40°C, and it did so until the end of the simulation. The water mist nozzle successfully lowered the temperature and prevented further spread of the fire in the given time. Although the fire was not extinguished until the end, the temperature was lowered to an acceptable level (between 25°C and 40°C) enabling the safe evacuation and easy access for firefighters.

Conclusion

Based on the CFD modelling and analysis of the obtained temperatures, we can conclude that the water mist system is several times more efficient than the sprinkler system in residential areas (living rooms and kitchens). In the first example, water mist drastically lowered the overall temperature and almost completely extinguished the fire that originated on the couch. A similar conclusion can also be made for the second example. Although the water mist system did not completely extinguish the fire, it maintained it around 30°C until the end of the simulation, while the classic sprinkler failed to lower temperature below 90°C until the end of the simulation.

A water mist system must not be seen only as a system that effectively absorbs the heat in relation to the classic sprinkler, but as a system that creates a hypoxic environment. Due to rapid evaporation and expansion of water vapour, it leads to the displacement of oxygen and reducing its concentration. The intensity of the fire is decreasing significantly when reducing the percentage of oxygen in the atmosphere. Also, in the end, it is important to once again conclude that the water mist system with reduced temperature to a much lower level compared with the conventional sprinkler system in the shortest possible time. In this way, evacuation time of the affected area is increased and the damage caused by a fire is reduced. **APF**

Marijan Kamenjašević is a fire protection engineer in Zagreb holding

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A fire vessel delivered to New Charleston equipped with large capacity pumps. Photo courtesy of MetalCraft Marine



Recent Trends in Fire Pump Applications

Michael C. Ruthy

W.S. Darley & Co.

The Fire industry is historically hesitant to change, and why shouldn't it be? If it ain't broke, why fix it? For hundreds of years we've put out Class A fires with just plain water. It works. It works well. How are we going to improve on that?

There are a lot of companies around the world that are using new technologies to improve fire fighting methods and techniques, and these are worth reviewing to see if they may be appropriate for your department and your community. For those purists, many of these techniques still just use plain water, but in different ways. I agree that for most fires, water is our best tool. Consider some of the new ways to apply water and ask for demonstrations for the additional effectiveness.

One of the trends in the US, coming out of the military, or more specifically, the US Air Force, is the use of water at Ultra High Pressure (UHP), in many cases over 1300 pounds per square inch (psi)/90 Bar. Systems that can deliver 300 gallons per minute (GPM)/1150 litres per minute (LPM) at 1300 psi/90 Bar have been delivered and tested with excellent results. These systems require extreme power and are not suitable for most commercial chassis in general. Oshkosh Corporation

has delivered several vehicles to the US Air Force, and all tests to date have been quite promising.

The high speed discharge of such a fire stream is quite remarkable – it literally suppresses the flames by blowing them out, like a breath of air on a candle, except at 1300 psi/90 Bar and including water. This new development has caught the attention of the National Fire Protection Association (NFPA), which has defined such systems in its latest upcoming edition of NFPA 1901.

UHP is also popular on small All Terrain Vehicle (ATV) sized units, where water carrying capacity is always at a premium. Making the most of your on board water supply is always a goal. One new product on the market is providing the best of both worlds, providing a UHP system for maximum firefighting duration, along with a higher volume pump to provide quick refills from nearby water sources or the ability to relay water to other vehicles in higher volumes. A local US supplier, E.J Metals, has built a large number of such ATV

FIRE PUMP TECHNOLOGY

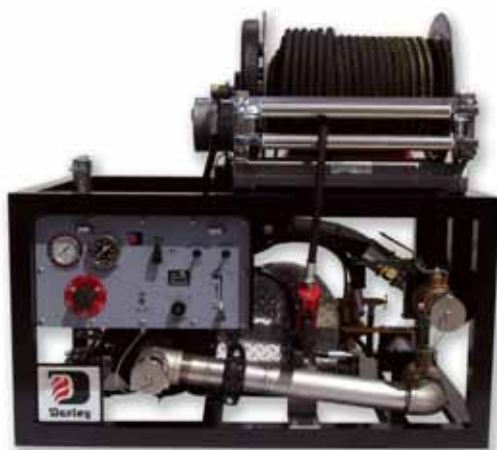
*Discharge of
Compressed Air Foam
stream from a high-rise
building*

*Photo courtesy of
W. S. Darley & Co.*



sized vehicles, which are very popular in wildland settings.

In many parts of the world, there is a competing trend toward very large pumps, sometimes 3500 GPM (13,250 LPM) or more. These are most popular on industrial fire pumps, such as those protecting petrochemical facilities, and also popular on large fire boats. Some shipbuilders, such as Canadian firm MetalCraft Marine, have built vessels equipped with two such pumps, for a whopping 7000 GPM (26,500 LPM) capacity. While not generally needed on a fire boat, vehicle mounted pumps needed improved priming capabilities. Many of these vehicles require multiple 6" or 8" hose connections when operated from draft, and a conventional 12 volt rotary vane primer is insufficient to prime in an adequate priming time. Using multiple primers is an option, but the electrical loads can become excessive in short order. This has led to the development of belt driven primers of greater capacity that can prime multiple 8" lines in less than 30 seconds. We expect this technology to drift down to smaller capacity pumps as well.



*Slide in unit capable of Ultra-High Pressure
and High Volume*

Photo courtesy of W. S. Darley & Co.

In other parts of the world, the trend seems to be headed toward smaller vehicles. In Singapore, for instance, their Fire Service is embracing what they call the Light Fire Attack Vehicle, more affectionately known as the Red Rhino. These are small, nimble vehicles that can get right close to the action, even on narrow streets. Despite their size, they are equipped with a 500 GPM (2000 LPM) pump and have some Compressed Air Foam (CAF) capacity as well. Their lineup of fire bikes, known as the Red Scorpions, are also equipped with CAF, and as motorcycles, can weave through congested traffic quite easily.

Compressed Air Foam (CAF) systems are nothing new, but some of the applications are taking a new direction. Recently, tests in Beijing and Shanghai have shown the effectiveness of these systems in high rise fire fighting. Due to the inherent lightness of its fire stream compared to plain water, it is possible to pump a compressed air foam stream considerably higher than a plain water stream could go, and do it while maintaining relatively low pressures so that standpipe systems are not over pressurised. Testing has been done on buildings as tall as 100 storeys.

One trend in the US, that has been commonplace in most other parts of the world for years, is a trend toward using Power Take Off (PTO) driven pumps. Many departments and builders are starting to realise there is a continued de-emphasis on pumping operations. By some reports, only 5% of US fire calls involve actually pumping water, down remarkably from a few decades ago. This is likely due to more emphasis on sprinkler systems, greater use of fire retardant materials, and similar trends, but it is changing the role of the fire truck in many departments.

As departments are responding to a greater percentage of medical and rescue calls, the trend has been to have less emphasis on the pump compartment and more emphasis on additional equipment storage. Nowhere has this been more evident than on recent vehicle designs by such builders as Pierce, Crimson, and Emergency-One, who in recent years, came out with new designs that emphasised equipment storage capacity. To

do this, they all utilised a PTO driven pump. Unlike rear mounted pumps, popular in much of international markets, they all maintained a more US traditional midship mounting location. They all have reported significant space and weight savings, as well as reaping some of the safety benefits of a PTO drive versus a split-shaft midship style pump.

Sprinkler systems are getting a boost in the US as more communities and States are now mandating them on new residential construction. We expect this to expand to more areas of the world. Given that the expertise of a typical homeowner would not be expected to be that of the owner and operator of a commercial property, a few novel solutions have been brought to market. There are systems that can self-test themselves on a regular basis, and alert a homeowner via mobile phone messages the results of such tests. Should the system record a need to deploy, it can contact both the homeowner and the local fire department automatically. We believe the simplicity of operation for such systems will be a big driver toward the average homeowner, who presumably may not want anything more complicated than the thermostat on their boiler.

One disturbing trend affecting many fire departments worldwide is the requirement to deal with vehicle emissions. While I think we can all say that having cleaner air and cleaner water are good goals, from what I have seen, some regulations in some countries are moving faster than they are ready for. This has led to trouble, and does not look like it will get better soon. The predominant issue is the type of fuels available in different parts of the world.

In the US, we are rapidly approaching the adoption of what is known as Tier 4 Final regulations. For most engine manufacturers, this has required the installation of a Diesel Particulate Filter (DPF) and a Selective Catalytic Reduction (SCR) system. On vehicles, this takes up valuable space, and on skid mounted engine driven units, it can be equally problematic.

For overseas customers, this can lead to complications, as a Tier 4 engine cannot burn even low sulphur diesel fuel, but must be fed with ultra-low sulphur fuel, which is not available in all countries, even those that are ramping up requirements for these level of emissions. Needless to say, this is a recipe for disaster. Many engine manufacturers have intentions to maintain offering Tier 3 compliant engines for these areas of the world, but this, at times, results in long lead times and paperwork nightmares. Granted, it is a bigger nightmare to have your after-treatment exhaust components clog up after one tank of fuel, but it is certainly something to be aware of when you order new equipment.

Finally, in the material science end of things, it keeps getting better. As the trend for more power through smaller pumps has continued, the usage of what used to be exotic alloys in both stainless

steels and bronzes has kept pace. Many of our pumps now utilise precipitation hardened stainless steel for their pump shafts, and aluminum nickel bronze for their impellers, resulting in stronger splined connections for more resistance to abuse and improper engagements. Several years ago, these materials would have been prohibitively priced for most applications. Hopefully, additional materials become more cost attractive so that all pump manufacturers can offer lighter weights and stronger alloys.

I'm still looking forward to eventually designing a pump out of Titanium. With the strength of heat treated steel, the corrosion resistance of 316 stainless steel, and the weight of aluminum – that would be awesome. The downside of course is some multiple of the material cost of Silver and the machinability of hardened Tungsten – it might not happen in my lifetime, but even an engineer can dream!

APF



*Small, agile vehicle with 500 GPM (2000 LPM) pump and CAFS
Photo courtesy of Kevin O'Sullivan – International Sales*



*High volume 3500 GPM (13,250 LPM) pump equipped with a belt-driven primer
Photo courtesy of W. S. Darley & Co.*

Mike C. Ruthy is Chief Engineer for the Pump Division at W.S. Darley & Co. He graduated from Lafayette College in Easton, Pennsylvania, USA in 1985 with a Bachelor of Science degree in Mechanical Engineering. He was employed by Hale Fire Pump Company in Conshohocken, Pennsylvania, before working for W.S. Darley and Co, in Chippewa Falls, Wisconsin, USA, in 1989, where he took the position of Chief Engineer in 1996. He has worked with over 100 companies internationally and is available at mikeruthy@darley.com

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Graham Collins

PPE Innovations Update

The past year has seen a bumper crop of new pieces of Personal Protection Equipment (PPE) come onto the market. There have been significant developments in new fabrics, along with new helmets and boots, so it is a good time to review what is now available to make firefighters and rescue personnel's lives more comfortable and – above all – safer.

Bushfire Firefighters Engineered Fabric

HAINSWORTH TECHNOLOGY's Eco-Dry Shield products have been specifically engineered to combine the unique properties of wool, meta-aramid and Lenzing FR to offer what the company believes is the best solution for wildland and bushfire firefighters. Due to the special nature of the end use, this fabric has to be fire retardant to extreme radiant and convective heat, while also providing wearers with the best levels of comfort during activity. The single-layer construction provides the user with maximum possible flexibility and mobility over an extended period of time.

Eco-Dry Shield provides a reduction in weight, making the product more lightweight for



firefighters, without any compromise in protection. It also offers users far greater levels of comfort; a key issue raised by firefighters who have to wear their PPE on the front line.

Harnessing the natural characteristics of wool and Lenzing, Eco-Dry Shield is breathable from skin to the outer meta-aramid surface. Wool's natural hygroscopic function coupled with Lenzing's hydrophobic function in the presence of moisture work in combination as a moisture pump and heat regulator. Australian wool provides excellent moisture management and micro-climate control, which works in conjunction with the Lenzing to lock away moisture that cannot evaporate fast enough, increasing the wearer's comfort. It is also antimicrobial, odour resistant, antistatic and sustainable.

Eco-Dry Shield offers good abrasion resistance, pilling, strength, thermal protection and colour fastness, and the excellent thermal protection of wool and meta and para-aramid yarns ensuring no wash out or degrading over time.

For more information, go to www.hainsworth.co.uk

Australian wool provides excellent moisture management and micro-climate control, which works in conjunction with the Lenzing to lock away moisture that cannot evaporate fast enough, increasing the wearer's comfort. It is also antimicrobial, odour resistant, antistatic and sustainable.

Trio of Protective Suits

The LHD Group has introduced three new protective suits: the new Lion V-Force Max protective suit with integrated rescue system; a protective suit for firefighters with a unique, flame-retardant outer fabric; and a new wildland protective suit.

The new V-Force Max incorporates a new material, TenCate Gemini XTL, which offers tensile strength, flame-retardant properties, a high level of protection against moisture and heat and very low abrasion figures. It is lightweight, flexible and breathable, and the outer fabric is combined with the Gore-Tex Membrane Airlock 3L. Airlock spacer technology ensures heat protection yet allows for a very low level of heat stress. It is based on the thermal protective effect of a layer of air which is formed between two layers of fabric. Hence, the weight of the garment is reduced by up to 50 percent. As a result of the three-layer construction an additional inner lining within the suit is redundant.

The new rescue system of the LHD Group is also incorporated in the V-Force Max. This consists of a certified combination of a rescue loop as specified in EN 1498:2006 Class A and a restraining belt in accordance with EN358:1999, providing both a retaining function to prevent falls and a rescue loop for emergency action. The system is completed with a connecting feature that is certified in accordance with EN795:2012 Class B. The belt is closed only when it is needed so that other clothing functions, for example, the panic zipper, can still be used to its full extent.

The new Lion protective suit for firefighters incorporates a unique, flame-retardant outer fabric. This material consists, for the main part, of Lenzing FR fibres and is extremely comfortable and breathable. The integrated flame protection cannot be removed by cleaning and scrubbing and protects the wearer from fire, radiant heat, electric arcs, molten metal splash and flammable liquids.

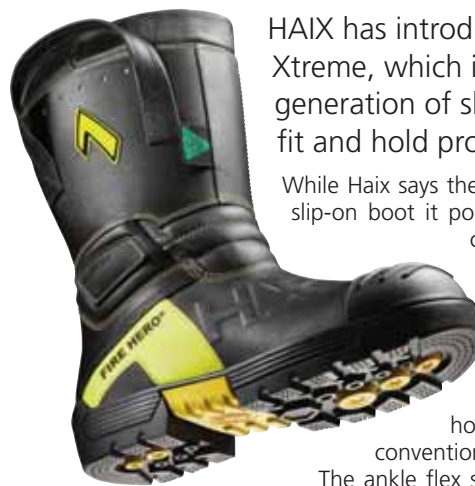
The relatively light assembly is suitable for incorporation in ergonomically-designed protective suits with a high level of freedom of movement. The use of water vapor permeable, perforated reflective strips also supports the high level of breathability.

The new single layer wildland protective suit with Tecasafe outer fabric provides protection against flames and electric arcs, and is also comfortable to wear. Due to its moisture control properties, the fabric dries quickly and provides a high level of breathability. The Tecasafe fibres retain their intensity of colour even after numerous industrial cleaning sessions. It is available in bright yellow or orange.

For more information, go to www.lhd-group.com



Slip-on Hero



HAIX has introduced its new Fire Hero Xtreme, which it describes as: "a new generation of slip-on boots with outstanding fit and hold properties".

While Haix says there is nothing quicker to put on than a slip-on boot it points out that such footwear often sits comparatively loosely on the foot and is unable to compete with lace-up counterparts. The secret of the new Fire Hero Xtreme lies in the special shoe construction and in the ankle flex system developed by Haix. These features enable a degree of hold to be achieved that rivals that of a conventional lace-up boot.

The ankle flex system enables it to adjust to different foot, ankle, and heel shapes, so providing optimal fit in the boot. When wearers are kneeling down, an integratal bend zone in the instep area and above the heel offers a high level of flexibility when moving either forwards or backwards. The Fire Hero Xtreme is safe and comfortable and comes fully equipped with all the typical Haix functionality but without a complicated fastening system.

High-quality Crosstech membrane technology is used under the boot's hydrophobic leather. This provides water resistance and high breathability and is even able to keep out blood and other bodily fluids, so safeguarding wearers against viruses and bacteria and giving enhanced protection against chemicals. Haix Secura liner is a footwear inner liner that will never pull out or wrinkle up over time. The lining is firmly secured and sealed along with the upper leather beneath the sole.

An extremely light Composite HX toecap ensures the highest degree of safety in the toe area, while the highly wear-resistant foam rubber shell sole offers a stable non-slipping sole edge for uneven terrain. The honeycomb tread pattern and suction cups offer excellent traction on slippery and wet surfaces.

For more information, go to www.haix.com

New Structural Fire Helmet

Almost 30 years after the first introduction of the Gallet F1 helmet, MSA is about to introduce its new generation structural fire helmet – the new Gallet F1 XF. It is being heralded by MSA as:



“truly the first structural fire helmet designed with firefighters for firefighters” and “bringing firefighter head protection to a new level”.

The new Gallet F1 XF offers improved impact protection through increased coverage of the liners and use of modern materials and manufacturing technologies. It also offers enhanced eye and face protection, with superior field of vision and area of coverage, and incorporates a unique dual pivot system for a perfect fit to every face to provide best-in-class comfort. It is available in clear or metal-coated versions, with certified anti-fog and anti-scratch characteristics.

The new helmet also delivers superior comfort with perfect balance and fit to the head, with intuitive and robust adjustments for all head sizes and user profiles. It features integrated proximity lighting with multiple LEDs, which enables safer progression in dark or poorly lit environments, and is suitable for use in explosive environment (ATEX approved configuration). A bracket is available for an external lamp.

Additionally, the Gallet F1 XF features helmet-mounted headsets, with a selection of microphones (bone conductive or noise cancelling) and single or dual speaker configuration, without any compromise on comfort, plus connection to radio through a push-to-talk (PTT) module. High-performance ear muffs with electronics level dependent attenuation and communication capabilities are also incorporated into the design.

Modular design allows for quick and easy inspection and maintenance, reducing dramatically the lifetime cost of ownership over the product lifetime. It is available in two sizes to fit all users and customisation options are available including multiple colours, printed or metal badges and stickers to identify rank or function.

For more information, go to www.MSAafety.com



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Full Monty Comfort



According to ARMADILLO MERINO, next-to-skin clothing is an essential but often overlooked component of an effective layering system and by selecting the correct fabric you can significantly improve the protection, performance and comfort of the wearer. So, the Monty shirt – a recent addition to the next-to-skin PPE offering from Armadillo Merino – is a mock-turtle, long sleeve shirt that is constructed from a high performance jersey knit merino fabric using superfine 17.5 merino wool.

The Monty uses a fabric that offers no-melt, no-drip protection against the skin with the natural FR properties of wool, which can be effective against ignition up to 600°C. The garment also protects against static discharge and UV light and can be used by wildland firefighters looking for a lighter weight, more versatile ensemble combining FR and sun protection.

The knit structure of the Monty is effective in managing heat build-up and actively manages moisture, absorbing sweat as a vapour and then as a liquid on reaching perspiration point. The fabric has the ability to hold up to 35 percent of its weight as moisture without feeling wet and by actively moving the moisture away from the skin it greatly increases user comfort. The Monty can be worn for hours or even days without odour build-up, which is great in team environments or for during multi-day events. The Monty can also delay the onset of sweating and amount of sweat generated, which can help in optimising a wearer's performance and recovery rate by reducing the moisture loss and calorie burn.

User comfort features include removing internal labels, raglan sleeves and a long back with the use of a single panel running under the arm from the wrist to the waist removing annoying seams.

For more information, go to www.armadillomerino.com

New Generation Technical Rescue PPE Built on the XFlex platform

BRISTOL's RescueFlex is the company's latest generation of technical rescue PPE. Built on the XFlex platform, originally introduced for the company's latest structural PPE, the garments incorporate the three-dimensional design features that provide enhanced limb movement through the use of vented gussets, extra pleats and additional padding at key contact points.

The PPE conforms to European and International standard EN ISO 11612 General Flame, is available in a range of male and female



sizes and a range of colours – most frequently seen in the orange and high-viz orange associated with international rescue. A Gore Crosstech SR moisture barrier is used in combination with a choice of outer layers including Nomex Delta C, Kermel and Protex cotton.

Unlike three-layer structural firefighting PPE, USAR kit is not required to have a thermal barrier allowing a two-layered construction to provide the physical protection for rescue teams working in confined spaces among debris. In particular, protection is required against flame and water ingress, exposure to blood borne pathogens and hydrocarbons as well as the hazards of abrasion, puncture and tearing from sheared metal, timber and rubble. The coat and trouser combination features a special zip fastening that securely connects the jacket to the trousers to maintain the integrity of the ensemble under difficult entry and search conditions.

For more information, go to www.bristoluniforms.com



NFPA Compliant PPE

BRISTOL has supplied firefighter PPE to meet NFPA standards for many years and has taken the opportunity of the latest 2013 revision, which came into effect in August last year, to introduce two new NFPA ensembles based on both its Ergotech Action and XFlex designs.

The NFPA XFlex design is the main change in response to the new standard, as it has provided Bristol with the opportunity to add two completely new models to the NFPA range. While the original American style NFPA kit based on the Ergotech design has been modified to meet the new requirements, the XFlex models have allowed the introduction of PBI Matrix and Nomex Hainsworth Titan 1220 outer shell options, which provide the benefits of greater comfort and flexibility. Both incorporate a Gore Crosstech moisture barrier. As well as the use of underarm gussets and fully articulated three-dimensional ergonomic elbow and knee shaping to allow for enhanced body movement, the coat comes complete with Bristol's drag rescue device. Curved hem at front and back of the coat and on sleeves improve fit and compatibility with other garments such as gloves and boots and when wearing breathing apparatus.

Head-to-toe PPE modifications have also been included. For fire helmets, the design of helmet face shields or goggles must now meet ANSI Z87.1, the standard covering general requirements for eye and face protection, and fire hoods where vented crowns are being eliminated. For gloves and footwear new testing methods have been introduced. There is also a new slip-resistance test that is more realistic in assessing sole and heel traction and changes to the measurement methods for footwear flammability and sole heat penetration.

For more information, go to www.bristoluniforms.com



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The right response to CBRN



Steven Pike

Argon Electronics

The range of potential threats makes CBRN (Chemical, Biological, Radiological, and Nuclear)/HazMat (Hazardous Materials) response training a challenging business. However, electronic simulation equipment is making significant advances in effectiveness of exercises.

In recent years, the work of the emergency services has become increasingly difficult. Financial cut backs, increasing regulatory burden and inter-agency co-operation protocols all contribute to placing considerable pressure on individual service personnel, equipment and procedural systems. This situation is exacerbated by the rapid rise in the breadth and complexity of incidents that emergency services personnel have to address, and by the growing range of skills and knowledge that first responders are expected to retain and renew. Although often overshadowed by more common day-to-day incidents, the delivery of a comprehensive response to HazMat (Hazardous Materials) and CBRN (Chemical, Biological, Radiological, and Nuclear) events requires specialised consideration and attention that can only be neglected with acceptance of extreme consequences.

In preparing for HazMat and CBRN reaction and remediation, training exercises need to be not only regular, but also challenging. Training should stretch participants, and not permit them to just go through the motions. If trainees are not challenged, they are not alert; and if they are not alert, they are not learning – or, at least, not learning to a level that will assure optimum performance in the face of the most severe of circumstances. Hazmat and CBRN training must encourage the trainee to behave as if the exercise was a real event.

This is particularly true now that the emergency services are faced with many different challenges and no two incidents are ever the same. In recent years, the number of potential causes of incidents has increased considerably, ranging from the dangers of entering methamphetamine laboratories to dealing with the threat of terrorist attacks,



particularly involving devices such as so called dirty bombs.

To demonstrate the diverse range of threats faced by first responders, consider the very different issues posed by the rise of methamphetamine laboratories, which put both the public at large and responders themselves at risk. The need to flush out these laboratories is urgent; in addition to the risk of explosion there is a serious and constant threat posed to the environment and local residents by the chemical contamination from the hazardous waste of these laboratories.

Chemical reactions that occur during the manufacture of methamphetamine are so toxic that they can produce hazardous vapours that permeate walls, carpet, plaster and even the wooden structure of a building. Hazardous events at methamphetamine laboratories are on the rise and few of those arrested for manufacturing methamphetamine are trained chemists. This adds to the danger because these “cooks”, who have little or no chemical training and learn their formulas from other cooks on the Internet, are playing with chemicals that are highly corrosive or flammable. Some chemicals will react with each other – or even water – to cause a fire or explosion, or emit vapours that attack mucous membranes, skin, eyes, and respiratory tract.

Such dangers pose a whole host of issues but, historically, CBRN response training has involved trainees carrying real detection instruments, searching for small quantities of simulants and even, in the case of training for nuclear hazards, responding to hand-written signs showing the level of radiation present at a given location. These methods have of course been useful in training responders to deal with CBRN threats but compared with the options available today, they are severely limited.

For example, using real detectors in training temporarily takes equipment out of service. Worse still, it poses the risk of it being damaged and

decommissioned for a far longer time while it is repaired, recalibrated or replaced. There are also personal risks to trainees during exercises that involve simulants of hazardous substances, since even small quantities of this material can pose a real health hazard. As for using hand-written signs as indicators of the presence of radiation, this is of little benefit since it does not allow trainees to develop any understanding of how to handle and use detection instruments or how to interpret the readings they provide. In contrast, the use of simulation equipment has recently provided a much-needed upgrade to CBRN response training and is currently enabling the delivery of a highly efficient, flexible and cost-effective service.

Another advantage is that simulant detectors like those in the Argon Electronics range can be used in isolation or as simulation probes for use with real detection equipment they offer time and cost savings over traditional simulants or even the real detectors by avoiding excessive warm-up times. Electronic simulants are easier to control and are not capable of misuse in the same way as liquid simulants. Traditional simulants can saturate the training area and cause false positives, whereas electronic simulants have no environmental impact and can be used in public places. They can also be placed in a wider variety of locations, such as within vehicles or properties.

Crucially, simulators offer great flexibility in planning exercises. Instructors can prepare a scenario where the trainees do not know what they will encounter, which is extremely useful because in a real life situation the firefighters who are responding to an alert do not always know exactly what they are looking for. For example, the Argon Electronics LCD3.2e-SIM responds to electronic simulation sources that represent chemical vapours, toxic industrial substances or false positives.

Instructors can now manage the detection instrument training of multiple personnel, selecting the parameters for the activation of simulation



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instruments using PlumeSIM, a CBRN/HazMat response training simulator that provides enhanced flexibility and ease-of-use in field exercises and table top training for counter terrorism, HazMat or nuclear incidents.

It is designed on a Windows platform and allows multiple trainees to be managed and monitored from a computer at a central location. The software enables users to plan exercises on a PC or laptop without system hardware, offering a portable simulation system with easy-to-use menus that can be swiftly set up and used to create a diverse variety of virtual emergency scenarios. The instructor can plan a scenario that involves either single or multiple releases of hazardous materials and offers the potential to define a series of release characteristics, such as duration, persistence and deposition, for an extensive choice of substances. The instructor setting the training exercise can even define the environmental conditions that would affect the movement and/or state of the virtual plume during the timespan of the operation.

The instructor determines the parameters of the exercise using the Planning Mode, where a

paused time to firstly evaluate the validity of the scenario design, and then optimise the replayed exercise appraisal within a compressed time period. A pause can sometimes be extremely valuable in allowing instructors to evaluate, test or validate a student's progress and perhaps recommend changes in approach to ensure all participants get the very best out of the exercise.

In addition to its flexibility and ease-of-use, the system is also cost-effective for the end-users, since the number of simulation tools used can be expanded as and when budgets permit, and, because all simulators can be used independently, there is no redundancy of equipment. It is also possible for existing users of older Argon simulation detection instruments to upgrade their equipment.

Simulators and associated software are meeting the need for response training that prepares trainees for an unknown, unpredictable threat. Moreover, the capability of simulation equipment to play a vital role in improving the quality and consistency of training can only become more vital as budgets are tightened and governments seek the most efficient and effective options.

In preparing for HazMat and CBRN reaction and remediation, training exercises need to be not only regular, but also challenging. Training should stretch participants, and not permit them to just go through the motions. If trainees are not challenged, they are not alert; and if they are not alert, they are not learning.

common file format image map of the selected training area is utilised. By placing a virtual release source at any location on the map, simulated chemical and/or radiation plumes or hot spots can be created. Selection of environmental factors including the wind direction, its velocity, and temperature can then be made and, on activation of the exercise, an onscreen counter will display the exercise scenario progression in real time. Thus, in as little as a matter of minutes, a complex training exercise can be set up rich with variables that will truly challenge the trainees to think and act as they would in a real life situation.

Trainees can interact in three modes: table top mode, field exercise mode and post-event exercise review mode. Table top mode offers the opportunity for trainees to navigate a projected on-screen scenario using a standard gamepad controller, offering a level of familiarisation with the simulators that enables them to gain more from the subsequent field training exercises. Field exercise mode enables them to physically investigate a training area, where the system triggers readings and alarms on the simulation tools they carry by locally re-broadcasting the threat scenarios from deployed personal player units that track their progress using GPS data. All data is recorded and can be analysed after the field exercise using the after-action exercise review mode; all player movement and simulator activity can be reviewed by instructors and trainees at debriefing, providing individual trainees with detailed feedback on their performance, maximising the potential for the students to learn from their experiences.

During both the planning and review modes, the system can also be run in accelerated and

The use of such innovative training equipment has changed the face of CBRN/HazMat response training. These tools offer the ability to rapidly design multiple scenario options including the type of threat, the point of release or delivery mechanism from single or multiple sources, and a full range of constant or changing environmental conditions. With simulators now available that replicate some of the most widely used detection equipment globally, simulation exercises allow safe and cost-effective delivery of innovative training solutions for the current and the next generation of CBRN/HazMat response personnel.

Exercises using simulation instruments have enabled some specific problems to be identified and addressed long before a real life emergency. These have included problems of reading detection instrument displays accurately in bright sunlight, the difficulty of clearly communicating readings back to a command and control centre while wearing protective clothing, and the confusion that can arise if several personnel are using different detectors, each of which has been calibrated to output readings using different measurement scales.

Modern training simulation systems now play a key role in helping the emergency services improve response times, the safety of their personnel and the public, and their ability to combat a wide and varied range of CBRN incidents. Despite these economically challenging times, it is clear that governments worldwide are placing a high degree of importance on CBRN training. Simulation equipment enables first responder organisations to ensure that personnel are adequately trained to deal effectively with CBRN threats.

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Steven Pike is Managing
Director of Argon Electronics

For further information, go to
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— SINCE 1953 —



The History of Thermal Imaging Innovation



Tony Topf

Scott Safety

The first infrared line scanner appeared in 1947 – one image took an hour to produce – but real technological advancements have meant that these cameras now serve many useful purposes but none more important than those that help save lives.

Over the years, the capability of thermal cameras has advanced beyond the expectations of those who first worked on this technology. Originally developed by the military for use in combat situations, it was once an expensive technology with limited application in civilian situations. Modern thermal imaging capability originates from the development of heat-seeking missile technology in the 1970s. The British Navy first developed its use for managing shipboard fires and it was then adopted by the US Navy and the technology started appearing in many other military applications such as weapons sights and locating the enemy in hidden spaces.

Scott Safety identified an opportunity to exploit the technology for civilian use and by the late 1990s the company was using Barium Strontium Titanate technology and making thermal imaging affordable and more accessible to larger parts of the civilian fire service market. Early examples of portable cameras were head mounted but these were extremely heavy, cumbersome, difficult to use and as a result, take-up was poor.

It was the one of the first companies to offer hand held thermal imagers for the fire service but with little experience of using and deploying this type of technology, adoption was slow initially. These early cameras were still expensive, costing around \$20,000 each they were a significant investment and were treated accordingly. It was very common to see a fire service purchase one thermal imaging camera (TIC) that was kept in the Fire Chief's car and then not deployed with the team that needed it. Through building dedicated part-

nerships with their customers, manufacturers took on the role of educating and assisting them in understanding the real benefits of the new technology and how it could be used.

These original cameras sometimes weighed up to 7lbs and because they were so heavy, they weren't properly deployed to investigate the source of smoke. Firemen were already carrying many pieces of extra equipment and tools, so the TIC was often left behind. If used in a live situation, one person was responsible for carrying and using the camera and his colleagues then had to rely on him to communicate what he had identified.

Throughout the period from the late 1990s, through significant investment, manufacturers continued in their efforts to bring more affordable, easy to use technology to the marketplace. As the technology advanced, they were able to offer products with more features in smaller packages and as the demand increased, prices began to come down. Today's TICs are probably 80% less expensive than they were when they were first introduced to the market.

As a result of the wider use of TICs, users have learned how to interpret the images they see and TICs are used not just for finding a fire but discovering more about convection, monitoring how swiftly a fire is moving, locating victims, identifying different gas layers, seeing how much petrol is in a tank or chemical plant and for situational awareness.

Some modern TICs offer users the ability to select 20 different colour palettes but there is a debate about whether this ability may prove con-

THERMAL IMAGING

fusing to the user and require more equipment training and familiarisation time as a result. Users need to be able to understand the information as quickly and simply as possible. We have found that users will often prefer a black and white palette with the option to use intelligent colour settings showing objects as yellow when they reach 1000°C, orange when they reach combustion point of 2600°C and red when above 4250°C and a flash-over is imminent. Hazmat teams use the technology for leak detection and determining how much liquid is inside a tank in a hazardous situation and, in particular, for detecting methanol flames that are otherwise naked to the eye. Having these types of features can be critical when making quick, split second decisions that will have an affect on the survivability of those in the vicinity of the situation.

In recent years, fire and rescue services have become more proactive in identifying their own needs by working in cross-functional procurement teams to put together meaningful specifications and demands. Some of these demands have driven manufacturers to design smaller, fast attack cameras that can be deployed quickly, putting reliable, high specification and affordable equipment into the hands of those that really need it.

Whilst a large portion of the market needs small, lightweight, 'tactical' TICs, there is still a demand for cameras with enhanced features for use by specialist teams such as urban search and rescue, hazmat and law enforcement officers. These users may need higher resolution technology, larger displays and integrated tracking

systems with specialist accessories that add size and dimension to the camera. These may include laser pointers, lights, visible light cameras, transmitters, video recording for training debriefing and evidence collection. Depending on their role and requirements fire and rescue teams are now often buying 2-3 different types of camera to meet specific applications.

TIC video recording capabilities vary greatly between manufacturers and range from between 30 minutes up to 4 hours, so depending on the needs, this should also be considered. Specifiers need to decide on the general scenarios the TIC's will be needed for as this will dictate where in this range the cameras should be choosing. Some of the newer models have cameras that automatically begin recording when the camera is energised, removing the possibility of the user forgetting to turn it on. The image quality should also be tested in real life situation, as the performance can vary depending on the environment (i.e. heat and cold).

It's important during the selection process that through life costs, maintenance and repair charges are taken into account. Some parts may be suitable for factory repair and others could need to be replaced. Germanium lenses, for instance, are easy to replace but are not suitable for factory repair, so this will make an impact.

A real testament to the robustness of modern TIC's is the tumble test and customers should consider the manufacturers claims carefully in order to make the best choice. The US standard NFPA 1801 Standard on Thermal Imagers for the Fire Service

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stipulates that the TIC must be put into a 4ft (1.5 meter) drum and tumbled for 30 minutes in order to pass the test. Water submersion tests and spray jet tests are equally as grueling for the TIC's, but these tests ensure they are robust and sustainable pieces of equipment. Most manufacturers have TIC's compliant to IP67 (submersion in water for 30 minutes) but only a limited number have them rated to IP66 (90psi jet at 100lpm per minute). When you consider the possible real-life working situations, the jet test is a much more realistic test, so when procuring TIC's, it is recommended to look out for the results of these tests.

Improvements and developments in the design and technology of the modern TIC continue to be introduced. Many new technologies are pioneered in the US first and are then introduced into the European market. Some changes are driven by the differing Standards set in each continent or country; some are as a result of the differing modes of operation by the fire and rescue services. For example in North America, where fire fighting techniques are more invasive, BA sets often include a built-in radio beacon as standard. This is activated when a fire fighter becomes incapacitated and sends out a distress signal that can be tracked by receiver on the TIC. This facility means that we can provide a thermal imaging camera to rescue teams that has the ability to guide operators to a 'downed' firefighter very quickly. In an emergency situation, this could mean the difference to life or death.

The ability to package lithium ion batteries has made it much easier to manage equipment lasting up to ten years and has reduced the need for maintenance charging as is this case with nickel metal hydride batteries. Manufacturers are also moving towards the possibility of making IS or ATEX camera's for HAZMAT more widely available. Innovations in the exterior materials used and the advanced circuitry incorporated in these cameras means that TIC's are much more robust and able to withstand harsher environments compared to those on the market 15 years ago. These types of improvements have also lowered the overall weight of TIC's, making them much more portable and user friendly when deployed in real working situations.

There is no doubt that advancements in technology and engineering will continue to provide us with the opportunity for further product development but there is no doubt that Thermal Imaging technology has come a long way and access to this technology has transformed the way today's fire and rescue services operate.

Scott Safety is celebrating 80 years as a global leader in the development and manufacture of leading-edge fire protection, detection equipment and technology including safer industrial and military emergency preparedness and response. Since the introduction of thermal imaging technology to the fire services, the company has been at the forefront of innovation providing advanced, fire-ground proven TIC's to first responders for use in search and rescue, overhaul operations and hot spot identification.

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Tel: +61 (0) 7 3287 5504
Fax: +61 (0) 7 3287 5505
Email: asktheteam@bigredtruck.com.au
Website: www.bigredtruck.com.au

CHINA**ANCOM SYSTEMS INC**

Building 5, Courtyard 10 Village
Middle Road, North 3rd Ring Road
Beijing, PR 100011
Contact: Pei Zhang
Tel: 86 10 6202 7922
Fax: 86 10 6207 7929
Email: hung.fang@utoronto.ca
Website: www.ancom.cn
Dealer/Distributor

NORLAN ENTERPRISES, INC

Room 952, #218 Tang Li Road
Chao Yang District
Beijing, PR 100012
Tel: 86 10 84673721
Fax: 86 10 84673770
Email: helenwang@norlan.cn
Website: www.norlan.cn
Dealer/Distributor

WUXI RSP SAFETECH LTD

Block 3, Long Shan Wen Bo Industrial Park
Qian Yao Road, Wuxi
Jiangsu Prov.
Prc 214151
Tel: 86 510 8225 5991
Fax: 86 510 8275 4257
Email: mail@wfs.com
Website: www.wfs.com
Dealer/Distributor

HONG KONG**TIAN YOU INTERNATIONAL DEV CO**

Room 119, International Trade Centre
11-19 Sha Tsuo Road, Tsuen Wan
Hong Kong
Contact: Philip Shek
Tel: 852 24161241
Fax: 852 24169636
Email: info@tianyou.com.hk
Dealer/Distributor

INDIA**ASKA EQUIPMENTS LTD**

R-482, New Rajendra Nagar,
Sushil Muni Square, Shankar Road
New Delhi PIN – 110 060, India
Tel: 91 11 49458800
Fax: 91 11 49458844
Email: info@askagroup.com
Website: www.askagroup.com
Dealer/Distributor

INDONESIA**PT MITRA TEKNIKATAMA SUPPLINDO**

Jl Ekor Kuning No 1
Pasir Ikan
Penjari
Jakarta Utara 14440
Indonesia
Contact: Adelaide Sagitaria
Tel: 62 216 602 2144
Fax: 62 216 602 2146
Email: adelaide@mitrateknikatama.com
Dealer/Distributor

JAPAN**TEIKOKU SEN-I CO LTD**

5-13, 2 Chome
Nihonbashi
Chuo-Ku
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Contact: Mr Satoh
Tel: 81 332813026
Fax: 81 332813090
Email: ohno@teisen.co.jp
Website: www.teisen.co.jp
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MALAYSIA**CITO MARKETING, SDN BHD**

No 11
Jalan SS15/4B Subang Jaya
47500 Petaling Jaya
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Tel: 60 37311286
Fax: 60 37340583
Email: cito@po.jaring.my
Dealer/Distributor

SJA TRADE & SERVICES, SDN BHD

Kelana Center
Suite 72, Blk 1
Jalan SS 7/19 Kelana Jaya
Selangor
Darul Ehsan 47301
Contact: Hetty Zurin Hamdan
Tel: 60 37847400
Fax: 60 37848500
Dealer/Distributor

PHILIPPINES**SMARTGUARD PHILIPPINES, INC**

#16 Blk 4, 7th Street
Bacolod City
Negros Occidental 6100
Telefax: +63 34 7091549
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Email: rescue@smartguardphilippines.com
Dealer/Distributor

SOUTH KOREA**JINUTEC INTERNATIONAL DIVISION**

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Korea
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Tel: 82 31 3758558
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Email: hyna@jinutec.com
Website: www.jinutec.com
Dealer/Distributor

TAIWAN**ALL STRONG TRADING CO LTD**

No 110 Sec. 2
Chang An E Road
7th Fl. King Isian Bldg
PO Box 46-482, Taipei
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Fax: 886 2250 75253
Email: allstron@ms19.hinet.net
Dealer/Distributor

PACIFIC CENTURY INDUSTRIAL CO LTD

PO Box 55-719
6F-7 No. 21, Sec 3
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Website: www.orionsafety.com.au/
Dealer/Distributor

INDIA**M/S ASKA EQUIPMENTS LTD**

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Ganga Ram Hospital Square
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(All India Sales)
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Mobile: +91 11949458844
Fax: 011 27014413
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Website: www.askagroup.com
Dealer/Distributor

KOREA**NINE TECO CO LTD**

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Website: www.ninewinch.com
Dealer/Distributor

SINGAPORE**TETRA FIRE ENGINEERING PTE LTD**

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Ubi Techpark
Singapore 408564
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Tel: (65) 6841 4429
Fax: (65) 6841 5267
Email: tetra@singnet.com.sg
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ARCHER (S) PTE LTD

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Website: www.archer-systems.com
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Taoyuan County 320
Taiwan (R.O.C.)
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Fax: 886-3-4632376
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48 Jalan TP 7/2
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47160 Subang Jaya
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FIRE FIGHTING ENTERPRISES**AUSTRALIA****AMPAC TECHNOLOGY PTY LTD**

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Website: www.ampac.net
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Jungwon-Gu, Sungnam-City, Kyungki Do, Korea
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Fax: +82 742 7698
Email: himax@himax119.co.kr
Website: www.himax119.co.kr
Dealer/Distributor

NEW ZEALAND**AMPAC INDUSTRIES LTD**

PO Box 100-149, North Shore Mail Centre
Glenfield, Auckland
Tel: +64 94438072
Fax: +64 94438073
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SINGAPORE**ACCLAIM SYSTEMS PTE LTD**

Blk 104, Boon Keng Road, 05-01, Singapore 339775
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Fax: +656 299 3735
Dealer/Distributor

ALARM SUPPLY PTE LTD

63 Jalan Pemimpin, 03-07
Pemimpin Industrial Bldg
Singapore 577219
Tel: 00 656 258 3445
Fax: 00 656 258 6428
Dealer/Distributor

TAIWAN**HORING LIH IND CO LTD**

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Sec 2, Chung-Ho-City
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THAILAND**TEEYA MASTER SYSTEMS CO LTD**

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Bangkok 10320, Thailand
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AUSTRALIA**HD FIRE PROTECT PTY LTD**

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Eight Mile Plains
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HOLMATRO

AUSTRALIA**CHUBB FIRE & SECURITY**

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BRUNEI**IECS**

8A Simpang 558
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CAMBODIA**FIRESAFE CAMBODIA**

165 Sotheros blvd
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Website: www.firesafecambodia.com
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CHINA**HOLMATRO CHINA**

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Wujiang ETDC 215200 Suzhou
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Email: china@holmatro.com
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FIJI**PIONEER SUPPLIES**

161 Toorak Road Suva Fiji Islands
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Email: Mahesh@pio-sup.com
Website: www.pio-sup.com
Dealer/Distributor

HONG KONG**ABLESLINK COMPANY**

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3 Ka Fu Close Sheung Shui
New Territories Hong Kong
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INDIA**RESQ TECHNOLOGIES**

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Website: www.resqtechnologies.com
Dealer/Distributor

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JAPAN**AKAO**

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Tel: +81 66 532 4131
Email: eigyo@akao-co.co.jp
Website: www.akao-co.co.jp
Dealer/Distributor

KOREA**KYUNG JIN INTERNATIONAL**

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Dongdaemun-gu, Seoul Korea
Tel: +82 22 38 21 86
Email: info@kyungjinltd.com
Website: www.kyungjinltd.com
Dealer/Distributor

MACAU**TCT TRI-CONTINENTAL TRADING**

4/F-E, Dynasty Plaza Bldg.
411-417 Ald. Dr. C.
D'Assumpção Macau Macau
Tel: +853 7500 08
Email: TCT@macau.ctm.net
Dealer/Distributor

MALAYSIA**PANDAN NIAGA**

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Seksyen 33 Shah Alam Selangor
Darul Ehsan 40400 Malaysia
Tel: +60 351 221 310
Email: PNSB@pn.com.my
Website: www.pn.com.my
Dealer/Distributor

MONGOLIA**NANOPLANET**

House #3, 6th Khoroo
10th Khoroolol, Bayangol District
Ulaanbaatar 16081 Mongolia
Tel: +976 88 09 66 48
Email: info@planet-mongolia.com
Website: www.nano.planet-mongolia.com
Dealer/Distributor

NEW ZEALAND**CHUBB FIRE & SAFETY PRODUCTS**

3 Fisher Crescent (Private Bag 92207)
Mt Wellington Auckland New Zealand
Tel: +64 927 072 34
Email: FireandSafety@chubb.co.nz
Website: www.chubb.co.nz
Dealer/Distributor

PAKISTAN**HASEEN HABIB TRADING**

7, Shaheen View, Block 6
PECHS Main Shahr Faisal
Karachi Pakistan
Tel: +92 213 452 62 40
Email: FBarry@haseenhabib.com
Website: www.haseenhabib.com
Dealer/Distributor

PHILIPPINES**WALLGREEN INDUSTRIAL VENTURES
CORP**

62 West Avenue
Quezon City 1104 Philippines
Tel: +63 241 108 18
Email: WIVCOR@yahoo.com
Dealer/Distributor

SINGAPORE**ADVENTRA**

48 Changi South St. 1 486130 Singapore
Singapore
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SRI LANKA**HALCHEM LANKA**

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Email: inquiries@halchem.net
Website: www.halchem.net
Dealer/Distributor

TAIWAN**PARKSON TRADING**

3F No. 50, Huaning Road
Guo-Shan Dis. 80471 Kaohsiung City, Taiwan
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THAILAND**CHASE ENTERPRISE (SIAM)**

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Email: ChaseSiam@chasesiam.com
Website: www.chasesiam.com
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VIETNAM**WETEC TECHNOLOGY EQUIPMENT**

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Website: www.wetec.vn
Dealer/Distributor

HUSQVARNA CONSTRUCTION PRODUCTS

AUSTRALIA**HUSQVARNA AUSTRALIA PTY LTD**

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Fax: +61 8 8371 0990
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Website: www.lhd-group.com
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NEW ZEALAND AND ASIA-PACIFIC*(Excluding Australia)***PACIFIC HELMETS (NZ) LTD**

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SCORPE TECHNOLOGIES

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PT. CENTRAL ELEKTRINDO MANDIRI

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MALAYSIA

CETM ELECTROTEST SDN BHD

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REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

G-Force Nozzles: The Inside Story

Based on a highly customizable global nozzle platform design, the unique G-Force series of fixed, selectable, and automatic nozzles combine over 40 years of Task Force Tips design innovation and experience into true next generation firefighting tools. Manufactured exclusively at TFT's USA production facilities, the G-Force series is supported by an extensive infrastructure of 24-hour technical service representatives, on-line documentation, digital video training library, exclusive product serialization and tracking capabilities, and a proven 5 year product warranty. Incorporating unique performance components such as a stainless steel slide valve, inlet debris screen and protective fog pattern choices, the G-Force series delivers high performance and rugged dependability.

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The most recent lightning protection technology actually deters the strike from forming within the area being protected and so, unlike traditional lightning rods, avoids inviting the strike into the facility. Picture courtesy of Lightning Eliminators Australia.

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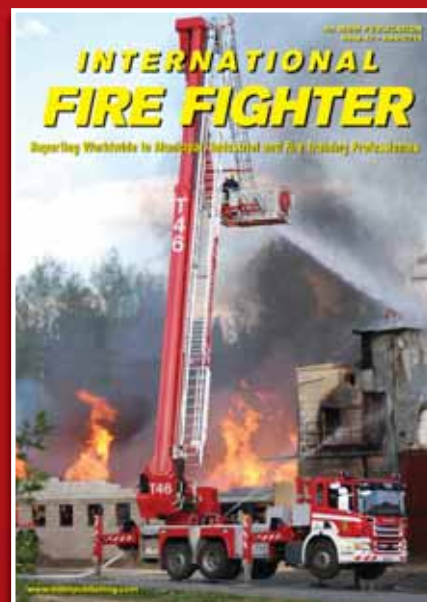




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Lest We Forget

While I am certainly no expert on the mysteries of the human brain, any more than I understand how memory works, I cannot help but suspect that we are all prone to forget things that we simply do not want to remember; in particular, those things that would otherwise demand an uncomfortable or unacceptable response on our part.

If I am correct – even if only in part – it might go some way to explaining why we seem frequently to “forget” the lessons learnt during and after major natural disasters, such as fires and floods. This is in no way to be taken as implying that those directly involved in front-line response to such events do not learn; indeed, many are unlikely ever to forget. What I am suggesting is that perhaps those responsible for policy and particularly for public funding seem to consistently demonstrate a propensity to insufficiently learn from past disasters or from the unpalatable advice being given to them by experts.

Let me explain. Following a Category Four cyclone that hit north Queensland in Australia

speaker argued for risks not to be ignored.

70 percent of all of the world’s natural disasters occur in and around the so-called “Ring of Fire”, impacting on vast areas of the Asia Pacific region, in particular Japan, Korea, China, the Philippines, Indonesia, Vietnam, Cambodia, Indonesia, Papua New Guinea, the south Pacific islands, New Zealand, and several more countries. All are at constant risk from well-known threats. So we are not dealing with “who ever expected that to happen” surprises. Even the size of the Tsunami that struck northern Japan with such devastating consequences had been predicted by scientists but – you have got it – once again the warnings were ignored.

According to the Australian Business Roundtable

Those responsible for policy and particularly for public funding seem to consistently demonstrate a propensity to insufficiently learn from past disasters or from the unpalatable advice being given to them by experts.

To learn, we have to do more than listen; we have to act. And when it comes to major disasters, doing nothing does not constitute action.

back in the 1990s a report was apparently prepared regarding the threat of a more severe Category Five event occurring. The report never saw the light of day and is probably even now gathering dust in an archive. Similarly, a report following the 1994 bushfire in Canberra predicting a fire similar to the fire that devastated the state of Victoria in 2009 was also ignored.

Surely, the reality is that if we do not learn, we are doomed to repeat the past. To learn, we have to do more than listen; we have to act. And when it comes to major disasters, doing nothing does not constitute action. Learning, and applying that learning should be the link between a past event and a future event. In this edition of *Asia Pacific Fire* there is an article reviewing the recent Australian & New Zealand Disaster and Emergency Management Conference that took place in the Gold Coast in Queensland, where speaker after

for Disaster Resilience and Safer Communities’ 2013 submission to the National Commission of Audit, each year an estimated A\$560 million is spent on post-disaster relief and recovery by the Australian Government compared with an estimated consistent annual expenditure of A\$50 million on pre-disaster resilience: a ratio of more than A\$10 post-disaster for every A\$1 spent pre-disaster.

The submission went on to suggest that the annual A\$6.3 billion cost of natural disasters in Australia is likely to grow by 3.5 percent every year, with the annual total economic cost of natural disasters in Australia expected to double by 2030 and reach A\$23 billion in real terms by 2050. If ever there was an argument in favour of action, surely this is it because, if we do continue to “forget”, it is the economic price we will pay down the line. And that does not even consider the cost in terms of human misery and loss of life. **APF**



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Tall Timber

A Study of Tall Wooden Buildings Prompts a Rethink of Fire Protection

Recently, the Fire Protection Research Foundation completed a first-phase hazard assessment related to high-rise timber buildings. We do not yet have a way to evaluate the performance of this new technology, and our work in this area is a fascinating example of how the drive toward environmentally sustainable building design around the world is causing us to rethink some of our fundamental assumptions about fire protection.

Wood-framed construction has been traditionally limited in height and area due to limitations in structural capacity and because of concerns related to the fire safety of this combustible material.

However, a number of innovations in timber products and composite systems have enabled efficient design of taller buildings. These innovations, combined with the view that timber is a sustainable building material, has prompted a renewed look at the prescriptive limits on the use of timber in modern building codes, as well as at the underlying fire safety issues.

The Foundation's hazard assessment was conducted at the request of the insurance industry. It addresses a review of existing fire safety design

standards, which generally prescribe a four-story height restriction. But many of us in North America have never seen a timber building over that height, and we are unaware of the portfolio of high-rise timber buildings under construction or in the design phase around the world. Those buildings raise questions about the fundamentals of our comfort level; wooden buildings as tall as ten stories, such as the Forté Building, a residential apartment building constructed of prefabricated cross laminated timber (CLT) panels and concrete floor slabs in Melbourne, are built or under construction, while others with more than 30 stories are being designed. Many of them are in jurisdictions with more restrictive building code environments than our own.

There is a general comfort level about how we address wood construction in codes and standards. But many of us in North America have never seen a timber building over four stories high, and we are unaware of the portfolio of high-rise timber buildings under construction or in the design phase around the world.

guidance, a large body of recent research, fire incidents in timber buildings, and a series of global case studies of both historic and recently built high-rise timber buildings of various construction types. The study, authored by Arup, offers research recommendations to address gaps in knowledge about timber system fire safety performance, and we hope to work with stakeholders to fill those gaps. The report is available online at nfpa.org/foundation.

On the surface, this is a fairly typical Foundation project: A new technology emerges, questions arise over the ability of codes and standards to address that technology, and the Foundation assists by providing the technical information needed to inform the provisions of the codes and standards. As we have worked with our technical panel and others on this project, however, I have realised that something is different here.

For starters, wood construction has been with us for a long time, and there is a general comfort level about how we address it in our codes and

Additionally, the materials used in many of these structures are new to us, and we do not have the information to make accurate evaluations of their performance. Finally, the inclusion of historic high-rise timber structures, like the nine-story Yingxian Pagoda in Shanxi, China, in the portfolio made us realise that some of the other fundamental assumptions that our building codes have historically been based on – compartmentation, sprinklers, and other forms of fire protection – are already changing as construction materials evolve.

With timber buildings, we have an "old" material transformed for use in new structural forms. As we attempt to define the performance we expect from timber in high-rise buildings, we will also gain a more explicit understanding of some of the fundamental assumptions underlying our standards – an extremely valuable process, whether that knowledge is applied to old technologies or new.

If you are interested in phase-two of this project, please contact Amanda Kimball, Research Project Manager at akimball@nfpa.org

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Kathleen H. Almand
NFPA Fire Protection
Vice President, Research

For further information, go to
www.nfpa.com

New Escape Hood Series

DRÄGER has re-engineered its escape hood portfolio, with the result that its new Parat series are quick to don and protect the user from toxic industrial and fire-related gases, vapours and particles for at least 15 minutes.

In just three steps the Parat escape hood is ready for use. When opening the packaging the filter plugs are automatically released and the filter is deployed into its end position. The hood is then ready for use. The escape hoods are equipped with high-performance filters with a service life of eight years. Replacing the filter after that time increases the service life of the hoods to a total of 16 years. A protective seal on the opening of the packaging indicates whether it has been opened. Additionally, the filter is sealed tightly with two filter plugs.

The escape hoods are available in three versions: industrial escape hood Parat 4700; fire escape hood Parat 5500; and fire and industrial escape hood Parat 7500.

The industrial escape hood protects against toxic industrial gases, vapours and particles. It is approved in accordance with DIN 58647-7 for filtering escape devices. Additionally, the filter is tested according to EN 14387:2004 for gas and combination filters. It is available in a hard case or soft pack version. The fire escape hood protects the user against fumes, vapours and particles with a CO P2 filter. It is approved in accordance with EN 403:2004 for fire escape hoods and additionally tested for use against H₂S (at a concentration of 2,500 ppm) according to DIN 58647-7. The Parat 5500 is available in a hard case, soft pack or single pack version.

The combined escape hood protects the user against toxic industrial and fire-related gases, vapours and particles with an ABEK CO P3 filter. It is approved in accordance with EN 403:2004 for fire escape hoods and DIN 58647-7 for filtering escape devices. Additionally, the filter is tested according to EN 14387:2004 for gas and combination filters. It is available in a hard case or soft pack version.

For more information, go to www.draeger.com

New NFPA-compliant Camera

ARGUS from e2v has produced its first range of NFPA 1801:2013-compliant Mi-TIC thermal imaging cameras that are claimed to be significantly smaller and lighter than any other NFPA camera on the market.

The NFPA 1801:2013 standard was created to specify design, performance, testing and certification requirements for thermal imaging cameras used by fire services during emergency incident operations. There are a number of rigorous tests including water resistance, abrasion and drop tests. Image quality is checked after every single test, so firefighters can be confident that there will be a usable thermal image when they need it most.

For more information, go to www.argusnfp.com

USAR Detect & Communicate



The ASB10 Vibraphone from SCORPE, an acoustic electronic device, is designed to detect and communicate with victims buried or trapped under rubble after an earthquake, landslide or collapsed building.

With an in-use weight of less than 2 kg and six hours of autonomy, the compact and robust IP44 control box is easy to carry and manipulate. It boasts a touch screen that displays information and

controls the device, making it easy to operate.

To widen the area of search and improve the speed of detection, ASB10 Vibraphone is equipped with six ultra-high sensitivity independent seismic sensors with an 8-metre cable length, while its three adjustable filters help to pick up precise and accurate signals. Communication with the victim is by the sound sensor incorporating a microphone and a loud speaker. It includes a recording feature enabling sound and bar graphs signals to be recorded that can be replayed later for training purposes.

Other features include an integrated instruction manual programmed in any language and an improved soundproof headset.

For more information, go to www.scorpe.eu

Repeater Panel Launch

FIKE SAFETY TECHNOLOGY (FST) has launched a repeater panel as part of its TWINFLEXpro smart two-wire fire detection system. The repeater panel is a small remote display unit that can be connected to a four or eight zone version 2 TWINFLEXpro panel via an RS485 data link, with a maximum of eight repeater panels connected to a single control panel.



The unit does not itself connect to or control any devices; it simply reports all fire and fault events that occur in the system. It can also perform system actions over the data link, such as silence alarms, reset, sound alarms and silence buzzer. The repeater panel is intended to provide display capability at secondary building entrances, nurses' stations and at any location where the panel event information is required to be displayed.

The system incorporates the multipoint combined smoke and heat detector with built-in sounder, which allows the whole system to be easily installed using only one pair of wires for each zone. As multipoint offers seven different modes of detection, the installation is made simpler since one device suits all applications. Checkpoint alarm confirmation technology is a feature of the system that has seen TWINFLEXpro installed extensively in applications such as houses of multiple occupancy (HMO). This is a configurable pre-alarm that can be set on detectors in dwelling areas that allows time to investigate the cause of the alarm before building-wide evacuation is initiated. This system has the ability to differentiate between call point and detector alarms; can accommodate a maximum of 32 devices for each zone; has separate fault monitoring display for each zone; incorporates a man-walk-test facility and zones can be configured without the need to use resistors or capacitors.

For more information, go to www.fikesafetytech.co.uk

Vehicle Extrication Techniques

Holmatro Unveils New Vehicle Extrication Techniques Book and App



Ian Dunbar

HOLMATRO introduces a brand new 256-page vehicle extrication techniques training book in English, and a new interactive app with more than 60 videos and 500 pictures explaining in detail the most common technical rescue techniques.



Vehicle Extrication Techniques Book

Written by Holmatro's own rescue consultant, Ian Dunbar, the book promotes a safe, methodical and casualty centred approach to the extrication of people following road traffic accidents. Not only does it cover rescue tools and techniques, it also highlights key medical considerations and guides the rescuer through the process of efficient extrication planning. All vehicle extrication techniques described in the book are illustrated by pictures and have QR codes referring to videos on YouTube showing how to perform these procedures.

The book is available in English. Other language versions will be published later this year and include German, French, Spanish, Portuguese, Dutch, Chinese, Russian and Arabic. English copies are for sale now through our worldwide dealer network. Details of the nearest dealer can be found in the Vehicle Rescue section of the Holmatro website at www.holmatro.com. The recommended retail price of the book is €14,95.

The book is part of the new Vehicle Extrication Techniques series, which also includes an interactive digital version published as an app for iPads and Android tablets and a poster series, explaining and illustrating various techniques and principles. Like the book, the app and posters will become available in multiple languages.

Vehicle Extrication Techniques App

This new interactive app with more than 60 videos and 500 pictures explains in detail the most common technical rescue techniques. Like the new book, the app aims to promote a methodical and casualty centred approach to the extrication of people following road traffic accidents.

In addition to showing how to perform the rescue procedures, the app guides you through the process of efficient extrication planning. To ensure a casualty-centred approach the app also introduces the rescuer to key medical considerations.

Important topics include:

- Safety.
- The vehicle.
- Medical aspects of rescue.
- The team approach.
- Extrication planning.
- Vehicle on its wheels, side and roof.
- Tools and equipment.
- New car technology.
- Hybrid/electric vehicles.
- Rescue at night.
- Extrication near water.
- Multi-agency working.
- Training.

The app is based on the training material presented in the Vehicle Extrication Techniques book. Like the book, the app is now available in English and translations will be added later this year.

You can buy the Holmatro Vehicle Extrication Techniques app in the App store (for iPad2 and newer versions) and in the Google Play Store (for Android 4.0 tablets and newer versions) at €14.99/\$16,99 (search for Holmatro Extrication). This app is a great resource for rescuers of all levels of experience and an excellent basis for training and development.



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To get an impression of what the new Vehicle Extrication Techniques programme is all about you can watch the trailer on holmatro.com/en/vet

For more information, go to www.holmatro.com

2014 AFAC Conference

Australasia's largest emergency services and public safety conference and trade exhibition, the 2014 AFAC and Bushfire & Natural Hazards CRC conference "After Disaster Strikes, Learning From Adversity" will be held in Wellington, New Zealand, to be held at Shed 6 and TSB Bank Arena from the 2nd to the 5th September.

The conference is designed for delegates with a responsibility for, or involvement in, emergency management. It is the principal gathering of emergency management practitioners, technical experts and researchers in the region.



Natural and man-made disasters strike all countries, but particularly in the Asia Pacific region. The conference will give delegates the opportunity to examine how emergency management services,

land managers and communities prepare, respond to and assist with disaster recovery, as well as, develop evidence-based policy and practice for the future.

This year's program includes 16 leading international and New Zealand speakers, as well as a range of industry experts, together presenting over 90 sessions across the four days. The trade exhibition will then expand on the wisdom of our speakers by showcasing a range of the industry's most innovative products and services.

For more information, go to www.afac.com.au/conference

USAR Sentry Duty



The LEADER Sentry provides additional security for USAR personnel when entering a dangerous structure. A simple program setting of the laser ray of the Sentry detects the slightest movement of a structure or mass that may endanger rescuers.

Two Sentry laser sensors can be linked simultaneously to monitor two different structures or two axis of movement of the same structure. If the movement of the structure under surveillance exceeds the warning threshold chosen, a powerful 98 dB alarm siren and a flashing light are activated to warn of an impending collapse, alerting rescuers to evacuate.

Among its many features, the Sentry offers: a laser beam range of 30 meters; adjustment by increments from 5 mm to 100 mm to determine the acceptable maximum threshold of movement; a clear control screen showing movement in real time with the choice of imperial or metric measurement; the possibility of multi-sources power to be operational in all situations; and an automatic switchover to AA batteries back up if the main power source fails.

For more information, go to www.leader-group.eu

Performance LHD Hoses

TEISEN produced its first firefighting hose in 1903 and, since then, it has become the most experienced and largest firefighting hose manufacturer in Japan. Its Super Line LDH (Large Diameter Hose) is available with a diameter of up to 300 mm and is manufactured using a one-piece construction method, extruding the cover and lining in one step, with polyurethane inside a polyester jacket.

Features of the Super Line LDH include: minimised pressure loss; compact storage thanks to a new kind of rubber-like, polyurethane material; availability in long lengths; and excellent resistance to heat, fuel, chemicals, UV, ozone and weathering.

Five sizes are available, spanning in 50 mm increments from 100 mm to 300 mm diameter, with weights from 1.1 kg/metre to 4.8 kg/metre. Burst pressures are from 4.2 MPa to 2.8 MPa, with maximum working pressures from 1.6 MPa to 1.4 MPa.



For more information, go to www.teisen.co.jp

Anti-skipping Sprinkler

FM GLOBAL's US patented anti-skipping sprinkler technology has been granted a patent by China's State Intellectual Property Office. The technology features a sprinkler "shield" that prevents sprinkler water droplets from impinging heat-sensing elements of nearby sprinklers. However, FM Global is not in the business of manufacturing sprinklers; its purpose in researching and developing this technology is to share it with those companies that do manufacture sprinklers.

Ideally, sprinkler systems operate in sequential rings, which are defined by rectangles in the sprinkler array concentric from the fire centre. A skip occurs when a sprinkler actuates significantly prior to a neighbouring sprinkler that is closer to the fire plume, which can then adversely affect fire protection system performance.

For more information, go to www.fmglobal.com

SERV FA 50 Improves Firefighting Efficiency & Safety

On-Line Video Shows How SERV FA 50 Can Improve Firefighting Efficiency & Safety

GRADALL INDUSTRIES has produced a video to show how its strategic emergency response vehicle [SERV] FA 50 firefighting device can improve firefighting efficiency from a distance of up to 15.2 metres, while also helping to protect firefighters from traditional dangers. The video can be viewed at www.gradallserv.com

Designed and built by Gradall Industries, the SERV FA 50 features a rugged hydraulic boom, fully operational with a wireless remote control device that allows firefighters to stand and position themselves for a better view further from danger.

Telescoping out 15.2 meters, the firefighter commands the boom to perfectly position a stainless steel fifth-man water cannon that is mounted at the end of the boom. The rugged fifth-man can efficiently ventilate buildings by breaking through walls and roofs and reaching through windows.



After breaking through, the boom rotates the fifth-man 220 degrees as its 52 aqua jet nozzles direct a massive curtain of water into the fire. For chemical fires, the device also can dispense Class A or Class B foams.

Often eliminating the need for firefighters to enter burning structures

or stand on roofs for manual ventilation, the FA 50 remote device can be operated from over 61 meters away. For extra convenience, and to reduce firefighter fatigue, the remote device can be affixed to the firefighter's belt.

The FA 50 can be mounted on trucks produced by leading fire truck manufacturers. The FA 50



frame includes four stabilisers – also controlled using the wireless remote – for short jacking capability. Stabilisers telescope out and down, and can be positioned all at once or independently. **APF**

FA 50 Specifications

Weight: 10,433 kg.

Two hydraulic motors: Swing 20hp (15kW) @ 1.0 rpm; tilt 20hp (15kW).

Hydraulic system: 0 to 160 litres-a-minute, up to 400 psi.

Telescoping Boom: Reach 15.2 metres, rotation 110 degrees, tilt left or right.

Fifth-man Water Cannon: 5,670 litres-a-minute and 120 psi, Class A and Class B foam.

Oil capacity: 208 litres.

For more information, go to
www.gradallserv.com

New Technical Search Equipment

LEADER has introduced what it describes as: "a new generation of search equipment designed for technical search specialists by technical search specialists." It includes what the company claims to be the world's only multi-functional Hasty tool, enabling users to see, search and save with just one tool.

The Leader Hasty combines: a search camera mode for a visual and precise location of victims with a seismic detection mode for use with up to two wireless sensors with a range in excess of 100 metres in open field for detecting signs of life. The camera has an ultra-lightweight probe that is equipped with high intensity lights and flexible articulation of the camera head, which incorporates a microphone/speaker to allow communication between rescuer and victim.

The Leader Search wireless life detector



is used in rescue operations to detect and then locate the position of victims entombed in collapsed structures. It features three wireless seismic sensors with a range in excess of 100 metres in open field, and the additional option of up to three wired sensors. It comes complete with an ultra-lightweight and compact control box incorporating a full colour

screen and user friendly menus and graphics.

The Leader Scan UWB (Ultra Wide Band technology) life search and breathing detection device is capable of detecting the slightest chest or finger movements produced by breathing. It is designed to detect and locate live victims trapped or buried victims to a depth of 30 metres. A unique feature displays a real time graph, focusing on the strongest signal received by the sensor.

The Leader Cam search camera with communication system is used during rescue operations to enter confined spaces, visually locate and communicate with victims. It is ideal for use in a one man operation or when working as a team and has an ultra-lightweight carbon fibre telescopic probe, extra-large full colour screen, user friendly menu and graphics.

For more information, go to www.leader-group.eu

New Chinese Code Includes ASD Technology

According to XTRALIS, The new National Fire Code in China lists aspirating smoke detection (ASD) technology as a recommended fire detection system for six different applications and environments. The new code expands the use of very early warning ASD into applications previously protected by traditional technology such as spot detectors. The new fire code was released by the Ministry of Housing and Urban-Rural Development of the People's Republic of China and became effective on 1st May 2014.

ASD is listed as a recommended fire detection system for: high air flow environments including data communications and semiconductor industries; large open space and other special areas; cold storage environments; cultural heritage, museums and art centres, where unobtrusive detection is preferred; power generation and oil and gas processing facilities; and critical infrastructure where very early warning fire detection (VEWFD) is essential. This includes applications such as healthcare and warehousing that require the earliest notification of an impending threat to protect lives, assets and business continuity.

For more information, go to www.xtralis.com/vesda

Energy Company Chooses Foam Concentrate

THE SOLBERG COMPANY has been awarded a contract by Statoil as its foam concentrate supplier under a new multi-year Frame Agreement in order to achieve the high environmental stewardship standards for the energy company. In a prior agreement, Statoil selected Solberg as its partner in the Statoil LOOP Portfolio Program to develop environment-friendly 1% high-performance firefighting foam using no fluorinated compounds or other organohalogens.

The result is Solberg's Re-Healing RF1 1% foam concentrate suitable for use on all Statoil offshore and onshore installations. Re-Healing foam concentrates are an environmentally sustainable fluorosurfactant and fluoropolymer-free firefighting foam used to effectively extinguish Class B hydrocarbon and polar solvent fuels with no environmental concerns for bioaccumulation or toxic breakdown. The concentrate can be used in fresh, sea or brackish water and possess excellent fire extinguishment and burn back resistance due to its flow and rapid sealing characteristics.

The first platform selected for retrofit with R-Healing RF1 concentrate was the Kvitebjørn gas and condensate producing installation in the North Sea in the North East Atlantic. The second platform selected was Njord in the Norwegian Sea. On the new oil platform "Gudrun", re-healing RF1 has been used from day one.

For more information, go to www.solbergfoam.com

Up for the Challenge

ELKHART BRASS is the industry's most experienced manufacturer of durable and innovative firefighting and fire protection equipment. Elkhart products can be found in fire departments and industrial installations/applications around the world; tank farms, loading racks, refineries, building systems and off-shore drilling sites, as well as in military, marine, and municipal firefighting applications.

Well known for its commitment to quality, value, and customer service, Elkhart celebrated its 110th anniversary in 2012. Since its founding, the company has been owned and operated by the same family and is in the fourth generation of management. Elkhart Brass still operates at its original site in Elkhart, Indiana. In addition to manufacturing and management, the site also houses product research and development, engineering, product testing, and is one of the few fire industry manufacturing sites that houses a forge. Elkhart manufactures more than 2,000 products used in virtually every aspect of firefighting and can monitor the process from concept and research and development, through the foundry and manufacturing and, finally, delivery of specialised products.

Elkhart's goal has always been, and continues to be, to rise above the competition as an exceptional supplier to the national and international firefighting industry. Everyone at the company is up for the challenge, no matter what that challenge might be at the time. Firefighters are committed to making a difference in the world by saving lives, protecting assets and making the world safer; Elkhart believes in being equally committed to this charge as a supplier.

In order for firefighters to do their jobs successfully, they need to be equipped with the most reliable and durable equipment possible, plus be physically ready for the challenges of their profession. In keeping with this spirit of top performance and being a team member, Elkhart has committed to sponsoring events such as the 9-11 Stair Climb and the Firefighter Throwdown (www.firefighterthrowdown.usa.com). These events, exclusively developed for industrial and municipal firefighters, showcases firefighter athletes in a competitive environment that encourages a healthy lifestyle, physical wellbeing, survivability and promotes firefighter camaraderie.

One of the key attributes of Elkhart products is durability. Specific to an industrial environment, Elkhart foresees a long future in this market that includes refineries, offshore drilling, tank farms and more. Coupled with durability is reliability. What good is a piece of equipment if it is durable but



does not function properly when needed? Elkhart addresses both these considerations when working with an industrial customer to design and implement the best system possible for the installation. There are no geographic boundaries in its international considerations. Elkhart's team has experience in all areas of the world and this depth of experience continues to grow.

Elkhart Brass has made great strides in innovation. In vertical markets outside of industrial applications; innovation can be seen in products such as HEROPipe (High Rise Emergency Response Offensive), which is used in battling difficult fires in high-rise buildings. (www.threheropipe.com). This type of creative thinking is what sets Elkhart Brass apart from the others in the fire industry. Always bringing new products to market is its goal, but the company only introduces new products when they are clearly addressing a need in the market, or if it is a new idea on how to save lives and assets. Elkhart will make the investment in order to bring new thinking to the marketplace and welcomes customers offering their challenges to be solved because the result will benefit all in the fire industry.

Elkhart Brass understands the daily challenges firefighters face and knows what they need to perform. The company equips firefighters around the globe with the most innovative equipment available so they can succeed on all levels of the job from the mental focus, to the physical demands on your body and the equipment you use. Elkhart is up for the challenge.

APF

For more information, go to
www.elkhartbrass.com



Climate Change Dr & Flood Response

*Surrey FRS ICU from
Primetech featuring
Ka-band satellite
broadband and High
Definition video*



Climate change is driving more extreme weather events around the world. To assist firefighters coping with these effects, innovative technology collaborations, wider adoption of high bandwidth Ka-band satellite systems, and more compact and flexible vehicles and systems, are likely to drive future developments in fire and rescue services.

Richard Lycette

Many of the issues raised during major fires and flooding incidents are familiar to those in the emergency services who have to cope with the consequences – large-scale disruption to people's lives, loss of life, destruction of urban and rural terrestrial communications networks, and damage to properties, businesses and transport networks.

The emergency response management challenges are also familiar, but are likely to become more critical now that extreme weather events are becoming more common. These include how to ensure delivery of joined-up communications and command and control systems to create and share a common operational picture across all participating emergency response organisations during major single and multi-agency incidents; and how to mobilise organisations, resources and people quickly, flexibly and effectively to deliver emergency support to communities, families and businesses where it is most needed.

In the UK, for example, participants in emergencies can include: fire and rescue services, police forces, ambulance services, COBRA (the central government emergency response committee), central and local government departments (the Environment Agency, the Transport Department, surface rail and underground rail companies) and supporting agencies, the armed forces, Gold, Silver and Bronze commands, NGOs (non-governmental organisations) such as the Royal National Lifeboat Institution, RSPCA (Royal Society for the Prevention of Cruelty to Animals) Red Cross, plus local

community groups and individuals.

During major disasters and emergencies, emergency services, government departments and agencies need high bandwidth, robust, integrated emergency communications to support their command, control and coordination systems. These are used to assess threats and to manage, coordinate and deploy public safety resources efficiently across all single and multi-agency emergency command levels, both locally and nationwide.

One solution used to support this activity is high bandwidth Ka-band mobile satellite broadband systems from companies such as Primetech. These are being used to deliver robust, reliable voice, video and internet communications in the field, including high definition incident and command centre video, internet access and GIS (geographic information system) mapping, as well as to facilitate interaction between incident command decision making systems, such as VectorCommand's command support system.

From flood and fire zones at local command level on up to departmental and agency HQs, Ka-band communications solutions can deliver the critical emergency command, communications and computing networks fire, police, ambulance services and central and local government departments and agencies and the armed forces need to perform their difficult tasks to the best of their ability. Mobile incident command units, such as the unit supplied in the UK to Surrey Fire and Rescue Service, are now able to send full high definition video from the command vehicle back into

ives Firefighting Innovation

the command headquarters over the Ka satellite system. This is a radically new development, made possible by the higher data carrying capacity of more modern Ka-band satellite systems.

Such units can help manage resources, people and equipment as well as accessing television news services, risk database information, command, control and resource management systems, GIS mapping and imagery for creating and main-

tenance of a common operational picture, delivered quickly, efficiently and accurately. Other technology on the Surrey Fire and Rescue Service vehicle includes COFDM (coded orthogonal frequency division multiplexing) cameras. Body-worn, tripod and mast-mounted cameras can send imagery via COFDM to both the main vehicle and support vehicles, and then on up to higher commands.

Another smaller scale, more flexible unit is the recently launched Cobra Rapid Response Strike Vehicle, Primetech's completely new firefighting

Mobile incident command units are now able to send full High Definition video from the command vehicle back into the command headquarters over the Ka satellite system, and newly developed wide area incident ground WiFi units enable better use of ruggedly engineered tablets.

maintaining a common operational picture, delivered quickly, efficiently and accurately. Other technology on the Surrey Fire and Rescue Service vehicle includes COFDM (coded orthogonal frequency division multiplexing) cameras. Body-worn, tripod and mast-mounted cameras can send imagery via COFDM to both the main vehicle and support vehicles, and then on up to higher commands.

Newly developed wide area incident ground WiFi units enable better use of ruggedly engineered tablets (such as the Panasonic Toughpad) and laptops for improved information gathering and sharing, and effective coordination and deployment of people and resources. Primetech's own incident ground WiFi solution is a COFDM drop-down unit housed in a small, battery-powered Peli case. The delivers the benefits of WiFi and overcomes the limitations – WiFi access can be limited because it is a very congested network.

Using the Primetech system, a COFDM/MESH node can be taken away from the command vehicle and positioned so that it can create a link from the box back to the command unit. Within the confines of that COFDM drop-down unit the company has installed localised 802.11 connectivity. Effectively, the Cobra cold cutting system delivers localised 802.11 connectivity to the COFDM unit and then the signal rides on the back of the COFDM frequency back to the command vehicle. A resilient communications trailer provides satellite and wireless communications backup when emergency services and agencies need to set up temporary command and communications centres – in community centres, schools, offices or temporary shelters – or to supplement existing communications systems with extra capacity.

Towable by vehicles of any kind, the trailer is a self-contained, flexible and resilient communications unit that can deliver high bandwidth capability, in any location, via an auto-seeking Ka

satellite system, with multi-VPN automatic 3G failover and wireless communications from a five-metre pneumatic mast. Use of the trailer frees up larger command vehicles, essential during large-scale, wide area, multi-site and multi-agency emergencies.

The system delivers high pressure water mixed with a cutting agent (abrasive) that can cut through all known building and construction materials and allows firefighters to fight fires safely from the outside of the building. The lance delivers a precise mixture of water and abrasive through a 2.3 millimetre nozzle, which allows the vapourised water to then be pushed into the building.

APF



Primetech's Resilient Communications Trailer delivers flexible Ka-band satellite capability and radio comms in any location

Richard Lycette is a freelance writer on emergency services and systems

For further information, go to www.primetech.co.uk or www.emergencycommandsystem.com

Conference Address Think the Unthinkable

2014 Australian & New Zealand Disaster and



Graham Collins

The words of the Spanish philosopher and essayist, George Santayana: If we do not learn from history, we are doomed to repeat it, might well have been used as the conference theme for this year's Australian & New Zealand Disaster and Emergency Management Conference held on the Gold Coast in Queensland, Australia. This year's program included over 70 presentations and ten informative workshops.

Once again, the conference attracted disaster management experts from across the two countries and beyond, intent on sharing experience and learning from the latest research into how to best prepare for, respond to and recover from natural, man-made and man-assisted disasters. And, once again, disasters in the region this past year gave delegates much to analyse and ponder.

Keynote speakers set the scene for the conference, stressing from the outset the importance of collaborating, involving and sharing knowledge, of learning lessons from other peoples' past failures to leapfrog future problems; and the importance of preparation, planning, response and recovery and developing coordinated actions. They went on to urge politicians not to ignore risks and threats that are already known; to understand that the essential first step is to fully accept that a specific risk exists.

From the keynote speakers it was impossible to miss the fact that an unwillingness to accept the inevitable is understandable as it is more comfortable to ignore a risk or its size or impact. This is

particularly so when the looming risks are beyond the imagination. The message was clear, that those responsible for devising strategies and funding them must acknowledge that it is when, and not if we want to be ready.

More than 300 delegates to the conference were reminded that we are in the age of the unthinkable and we just have to accept it and act accordingly. In the past, many major events have been predicted – accurately as it turned out – but the recommendations and reports have never seen the light of day (perhaps they went in the “too hard” bin or at the back of the “not in this parliament” drawer). It simply has to be accepted that the world is what it is; not necessarily what we would like it to be. The only choice in the matter is how we respond. All too frequently at the moment we do not even plan for the expected, let alone the unexpected.

Setting the Scene

Few delegates needed reminding of the natural disasters that had helped set the scene for this year's conference. As at previous Australian & New

Assesses the Need to able

and Emergency Management Conference

Zealand Disaster and Emergency Management Conferences, many of the informal discussions focused on applying what was learnt at the various formal presentations to recent events.

For example, in 2013 New South Wales experienced some of the most challenging fire conditions the state had experienced in more than a decade, providing the first real test of the recent focus on information and warnings. January 2013 saw widespread catastrophic bush fire danger ratings and a number of large and destructive fires. Despite some of the worst conditions ever recorded, and the extensive fire activity, not a single life was lost. Then, in October 2013, more than 200 homes were destroyed in a series of fires across the Blue Mountains, Southern Highlands, Port Stephens and Central Coast. Throughout these fire events, the NSW Rural Fire Service delivered as many as a million telephone warnings a day, as well as engaging with millions of people through social media. The information effort saw a strong but measured response from the community.

In August in New Zealand a magnitude 6.8 earthquake struck south of country's capital Wellington, sending panicked workers and residents into the streets just weeks after a similar tremor struck the city, reminding many of the February 2011 Christchurch earthquake that severely damaged the city, killing 185 people in one of the nation's deadliest peacetime disasters.

Elsewhere in the Asia Pacific region, in November Typhoon Haiyan hit the Philippines. Considered one of the strongest storms ever to make landfall, it tore through the central Philippines killing nearly 6,000 people and displacing more than 3.6 million. In India in October Typhoon Phailin, the strongest cyclone to hit India in 14 years affected the livelihoods of more than 13 million people in the country's northeast. Fewer than 50 people died, with governments and aid organisations crediting improved disaster preparedness and the early evacuation of about one million of the most vulnerable residents along the coast.

Keynote Speakers & Conference

The dozen or so keynote speakers at this year's conference included Associate Professor Brett Aimers, Chief Professional Officer, St John Ambulance Australia, Dr Paul Barnes, Deputy Director of QUT Centre for Emergency & Disaster Management, Dr Penelope Burns, Senior Lecturer, Department of General Practice, University of Western Sydney, Mark Croswell, Director General of Emergency Management Australia, and Neil Comrie, Bushfires Royal Commission Implementation Monitor.

A feature of this year's conference was a



keynote speakers' chat room, where delegates could connect with keynote speakers immediately after their presentations to discuss specific points.

As with previous Australian & New Zealand Disaster and Emergency Management Conferences, the main conference was divided into a number of streams, providing the delegates with the opportunity to select from more than 70 presentations. The four streams for the morning of Day One were Risk Management, Human and Social Issues, Education & Training, Special Needs & Vulnerable Populations, and Business continuity. The latter three morning streams were replaced in the afternoon with Volunteer Involvement, Technology, and Open Topic.

The Day Two program had early morning streams of Policy & Governance, Relief & recovery, Social Media & Technology, Crisis Management, and Mental Health. The latter two streams were replaced in the second half of the morning session by Community Engagement and Open Topic. The conference also included 20 poster presentations.

The two-day conference was followed by an optional post-conference Workshops Day when delegates could choose from ten individual workshop topics covering crisis decision making, community resilience, policy, technology, social media, leadership, organisational behaviour and emergency planning. Workshop facilitators came from such renowned organisations as the Centre for Disaster Studies, Victoria State Emergency Service, and the Disaster Research Centre. **APF**

New Research Challenge

Pic courtesy Trocaire, an Irish charity and development agency



David Bruce

Bushfire and Natural Hazards Cooperative Research Centre



A new A\$130 million Cooperative Research Centre will draw together all of Australia and New Zealand's fire and emergency service authorities with leading experts across a range of scientific fields to explore the causes, consequences and mitigation of natural disasters.

The establishment of the Bushfire and Natural Hazards Cooperative Research Centre acknowledges the ongoing impacts of natural hazards upon communities, emergency service providers, governments, agriculture and other industries. The Bushfire and Natural Hazards CRC has received funding (cash and in-kind) of A\$130 million over eight years. An A\$47 million grant from the Australian Government's Cooperative Research Centres Program has been more than matched by support from the emergency service and land management agencies from all states and territories and New Zealand, as well as non-government organisations.

Research partners include leading universities, the Bureau of Meteorology and Geoscience Australia, and industry partners include the Australasian Fire and Emergency Services Authorities Council (AFAC) and the Red Cross.

The Chairman of the Bushfire and Natural Hazards CRC, Dr Laurie Hammond, said the CRC will build on ten years of high quality scientific research at the Bushfire CRC and will expand the research effort into other natural hazards including flood, earthquake, cyclone and tsunami.

"This investment in research is linked to the National Strategy for Disaster Resilience and will improve approaches to mitigation, operational responses and community resilience to natural hazards," said Dr Hammond.

The creation of the Bushfire and Natural Hazards CRC delivers on a key recommendation of the 2009 Victorian Bushfires Royal Commission that called on the Commonwealth to establish a national research centre for bushfire. The CRC is based in Melbourne but partners and researchers are in every state and territory and in New Zealand in a nationally coordinated research program.

The CEO of the Bushfire and Natural Hazards CRC, Dr Richard Thornton, said the CRC was largely end-user driven. "The emergency service

agencies, departments and non-government organisations around the country that become partners have a significant say in the development of the research program," said Dr Thornton. "The eventual utilisation of the research by the partners for the benefit of the broader Australasian community is critical to the whole process of developing a solid research program."

He continued: "Researchers and emergency service personnel will be working together under the Bushfire and Natural Hazards CRC on the major issues in natural hazards including fire spread modelling, severe weather forecasting, flood forecasting, storm surges, building in hazard zones, disaster education, and workforce and volunteer management. This will improve both the scientific understanding and the practical knowledge needed for communities to better prepare for, respond to and recover from natural disasters."

Importantly, most of the new research will not be hazard specific but cross-disciplinary, drawing on the expertise of scientists across a range of fields on issues common to all hazards.

The three broad clusters span the priorities for those working in multi-hazard environments:

- **Economics, policy and decision making** – allocating resources for the greatest benefit.
- **Resilient people, infrastructure and institutions** – identifying vulnerability, managing the risk and increasing resilience.
- **Bushfire and natural hazard risks** – improving communications, warnings and predictions through more accurate forecasting and modelling.

New Science for Safer Communities – Highlights of the Research Programme

● **Improving Predictions for Severe Weather.**

This project will use high-resolution modelling to better understand and predict important meteorological natural hazards, including fire

nge for Australasia

weather, tropical cyclones, severe thunderstorms, and east coast lows. This will help reduce the impact and cost of these hazards on people, infrastructure, the economy and the environment.

- **Getting a Better Sense of When Disasters Will Occur.**

Innovations in the field of remote sensing technology are now being applied across the range of natural hazards. Through this work, scientists are developing better forecasts of hazard events, better analysis of the pre-conditions to a hazard, and a more detailed and complex analysis of the impacts of actual natural hazard events.

- **Fire Spread Modelling.**

Researchers will develop the science to guide emergency and disaster management organisations to predict the rate of spread and intensity of bushfires across a range of fuel types.

- **Burning for Water and Carbon.**

Fuel reduction burning in eucalypt forests has traditionally focused on impacts to the trees. What has been lacking, but which has become increasingly important, is knowledge of the effects of broader fuel reduction burning on fuel loads, other vegetation types, and on the carbon and water storages.

- **Engaging & Retaining our Volunteers.**

As recent large disaster events have shown, spontaneous volunteering by largely untrained and unaffiliated community members has become a significant issue for governments and the emergency service agencies. Can more non-traditional forms of volunteering be called upon as a surge capacity as natural hazards events become more frequent? Elsewhere, volunteers are the backbone of the emergency services sector but agencies are grappling with how to avoid the high attrition rates that increase costs and reduce their organisations effectiveness by relying on a small overworked core of volunteers. How can organisations change from within to reverse this trend?

- **Planning to Make the Right Responses When Disaster Hits.**

Communication of risk and warnings are central to our natural disaster response but recent events have shown that communities under threat do not always act as expected, threatening their safety. This project will develop ways for better planning and preparations that will lead to safer responses during disasters and will allow for better recovery after the event.

- **Understanding the Tsunami Risk.**

Tsunamis are less common in Australia than other natural hazards. This presents a problem for emergency agencies attempting to educate or warn the public of a risk that has a low likelihood of occurring but a high impact if it did. This project will devise ways to better engage the Australian public on tsunami risk.

- **Working With Fire in Top End Communities.**

Almost half of the north Australian community are indigenous and the majority live in remote

communities ill-served by existing emergency services. Researchers will work with local communities to build on the existing knowledge of bushfires and other natural hazards to better deal with risks across the region.

- **Building Better Infrastructure.**

Inappropriate or outdated buildings in regions prone to bushfires, earthquakes, cyclones or floods, can exacerbate the impacts of these natural disasters. Researchers will be examining what good building looks like and how it can be achieved across our communities.

- **The Politics of Natural Hazards.**

Policy decisions made by all levels of government on emergency management may help or hinder the ability of communities to prepare for or respond to natural hazard events. How can the responsibility for community safety be a shared responsibility between policy makers and the community? How can the impacts of natural hazard events be reviewed to help communities prepare for future events and not just focus on past ones?

- **Counting the Costs.**

What are the financial implications and benefits across a range of options in natural hazard management? How do we calculate the full costs of damages from natural hazard events across all sectors of industry and agriculture?

- **Searching Our Past to See Our Future on Fatalities & Building Loss.**

Searching databases back to European settlement in Australia, researchers will analyse the trends in building damages, fatalities and injuries caused by natural disasters. These trends will be projected into the future in the context of emerging issues such as an ageing and shifting population, and a changing climate.

- **Preparing for the Worst – Always Including Children.**

Including children in disaster risk education increases their confidence and ability to deal with natural hazard events, reduces their risk and assists in recovery. Researchers will conduct a comprehensive review of disaster management plans across Australia to ensure they are child-centred.

- **Managing Animals in Disasters.**

Domestic pets, commercial animals, livestock, and wildlife – research has shown that communities under threat place a high value on providing protection for their animals, often at great risk to themselves. Researchers will develop guidelines and training for policy developers and emergency service responders to ensure animals are integrated in public safety education and messaging.

Keep in Touch

The new national research capacity is driving our ability to think differently about how to deal with natural disasters into the future. For more details visit www.bnhcrc.com.au, and keep up to date by liking the Bushfire and Natural Hazards CRC on Facebook, and following on Twitter.

APF

David Bruce is

Communications Manager at
Bushfire and Natural Hazards
Cooperative Research Centre

For further information, go to
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High-Rise Firefighting

Keeping the Firefighting Options Open

High-rise buildings can take a considerable length of time to evacuate in the event of a fire and can be extremely dangerous environments for occupants and firefighters alike. So firefighting at height needs to be quick, effective and – above all – as safe as possible if lives are not to be put at unnecessary risk.

A high rise building is defined in NFPA 101: 2012 (*Life Safety Code*) as a building more than 23 metres high. Having first really started to make an appearance on cityscapes a little over hundred or so years ago in the late 19th century when, as steel-framed structures, they started to punctuate the skylines of such cities as Chicago, New York, Philadelphia, Detroit, and St. Louis, high rise buildings are today commonplace across the globe. Indeed, China currently holds the record for the country with the greatest number of high rise buildings, and the world's tallest structure is the 828-metre high Burj Khalifa building in Dubai in the United Arab Emirates. The

new One World Trade Centre "Freedom Tower" in New York City is the fourth-tallest skyscraper in the world and the tallest building in the western hemisphere, reaching 541 metres into the sky. Australia's tallest building is the 323-metre Q1 (short for Queensland Number One) building on the Gold Coast in Queensland, the fifth-tallest residential building in the world.

Architecturally they can be imposing and often visually very impressive. But, for the firefighter they can be extremely challenging high-risk environments – as has been confirmed by operational reports from all over the world – that demand specialist firefighting equipment and techniques.



Jerry Herbst

Elkhart Brass



A major consideration when it comes to firefighting is the particular building's height or, perhaps to be more precise, the height at which the fire is taking place. If that floor level is within the reach of an available aerial platform or platform fire truck – currently between 34 metres and 40 metres – firefighting operation can often be carried out from outside the building. If, however, the floor on which the fire is taking place cannot be reached using aerial platforms or platform fire trucks, firefighting operations from outside are no longer possible. In the past this meant that the only option was to resort to inside attack in the floor where the fire was taking place in order for the fire to be extinguished.

one or two fire trucks. As swift containment of the fire and the safe evacuation of those trapped is the first priority, these first-on-scene firefighters will start work with whatever equipment they have at hand. Awaiting the arrival of more resources – personnel or equipment – is simply not an option and is clearly not in the mind-set of the majority of professional firefighters. This was so tragically demonstrated by the selfless bravery of the on- and off-duty firefighters who attended the 9/11 terrorist attack on the World Trade Centre in New York City.

High rise fires are frequently fanned by high wind speeds that are greater than those at ground

According to a 2013 NFPA report, in the period 2007 to 2011, there was an average of 15,400 reported structure fires in high-rise buildings every year in the USA with associated losses of 46 civilian deaths, 530 civilian injuries, and US\$219 million in direct property damage. Four types of property account for half of high-rise fires: apartment buildings, hotels, office buildings, and facilities that care for the sick.

This presents firefighters with several issues. These include the reliable availability of adequate water pressure at the floor where the fire has broken out; the prospect of fighting the fire by having to enter the fire-engulfed floor; and the availability of the best possible equipment if there is no option other than to engage the fire from the effected floor.

What You Have is All You've Got

The reality is that in most cases, the first firefighting response to a high rise fire will be the arrival of

level, the more so if the building is in a coastal environment where winds coming off the sea can be significantly stronger than those experienced inland. So, the priority should be for all first response vehicles to carry equipment that will improve the initial contact with the fire. This means that equipment needs to be compact to be stored on the engine where storage space is at a premium, and lightweight to be easily carried and man-handled by fire crews up numerous flights of stairs. The name-of-the-game has to be to maximise the



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Introduction

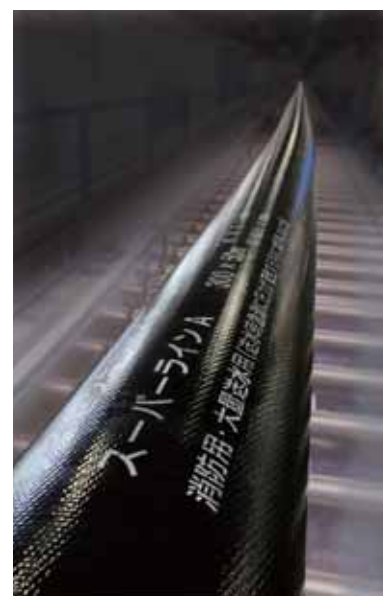
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Weight	kg/m	1.1	1.6	2.8	4.0	4.8
Burst pressure	MPa	4.2	4.4	3.6	3.0	2.8
Maximum working pressure	MPa	1.6	1.6	1.4	1.4	1.4
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efficiency of the equipment users, which is why maximising the firefighting options is so important.

Standpipe Flow & Pressure

When the only option is to resort to mounting an inside attack in order to effectively extinguish a fire in the upper floors, ensuring that water from the wet or dry standpipe or rising main has an appropriate flow and pressure on the floor from where the fire is going to be tackled is of critical importance. Water pressure in standpipes or rising mains can be inadequate for any number of reasons including scale build-up in the pipe, age of the installed system, lack of proper maintenance or vandalism of the system.

Traditionally, flow metres have been too heavy, cumbersome and large either to be stored on first-response fire trucks or carried up flight after flight of stairs by firefighters eager to reach the affected floor. This situation has been dramatically improved with the recent unveiling by Elkhart at this year's FDIC (Fire Department Instructor's Conference) in Indianapolis of an NFPA 14: 2013 (*Standard for the Installation of Standpipe and Hose Systems*) compliant inline, digital standpipe flow meter that is both lightweight (it weighs just 2.38 kg) aluminium construction and compact.

Significantly, the meter measures both flow and pressure for high-rise standpipe applications using an integrated sensor, taking the guesswork out of high rise firefighting by giving a visual confirmation of the flow. From the firefighter safety perspective, the new flow meter confirms the water flow and pressure prior to the commitment being taken to enter the fire zone or tackle the blaze. Via a dual LED display it measures pressures up to 17.2 bar and flows up to 946 litres-a-minute. It is one-touch battery powered by a 9V battery with quick-change housing with battery saving standby operation. The unit is programmable for both imperial and metric settings.

Up Close & Personal

Inevitably, there will be high rise fires where there is no alternative other than to attack with hand line nozzles. With firefighting manpower levels now decreasing worldwide (or so it seems) it is important, in a high rise fire with such life threatening potential, that nozzle selection gets particular attention. There is a particular need to be able to engage a fire at high flow rate with minimal nozzle reaction, so achieving a high flow rate at low pressure is a topic currently being discussed widely by senior firefighters.

Among the most popular nozzles from Elkhart for high rise firefighting is the fixed-flow, break





apart Chief nozzle that delivers a constant litreage from either a smooth bore straight stream or full fog at the same low pressure. With more than 300 available variations, it comes in true low pressure versions with specifically engineered, calibrated and labelled stems down to 3.5 bar.

Out of Harm's Way

Even with advances in flow metering and nozzle design, remote firefighting remains the safest option for firefighters. To achieve this in high rise buildings where the fire is above the level reached by aerial platforms or platform fire trucks Elkhart designed Hero Pipe, which delivers a high volume of water from the floor below the fire, directing it at the heart of the blaze.

Hero Pipe delivers the firefighting attack water from the exterior of virtually any building, targeting large volumes of water from an unmanned telescopic waterway utilising the company's Sidewinder EXM high-flow, electric remote controlled water cannon. The floor-below design provides a significantly safer option for the neutralisation of hazardous material fires and, once the proper attack point has been established, Hero Pipe can be set up by a two-man team, and be in operation in as little as two or three minutes. Safety features include a control valve and pressure gauge that are utilised to eliminate the need for standpipe operator communication.

The equipment can be used on conventional load bearing walled buildings and those incorporating curtain walling hung off the building's structural framework. The assembly's base unit is clamped securely to the window sill of the floor below the fire or, in the case of curtain walled structures; it fits directly on the floor slab and incorporates a non-slip base footing. In either case, the assembly is additionally restrained by the use of adjustable hydraulic stabilisers that are fitted between the structural floor and the structural ceiling of the storey below the fire. The pipe extends upwards out of the window to any height between 2.29 metres and 4.57 metres to the incident floor above. It incorporates a quick-connect coupler that ensures fast and easy adaptability, while a remote controlled articulated nozzle provides 40° horizontal movement and 80° vertical movement.

The system is transported in three parts comprising: the base unit; the waterway; and the hydraulic stabilisers. The assembly's base unit is a one-piece assembly and is unloaded from the fire truck and rolled into position like a wheelbarrow. The assembly's sill clamps incorporate a ratchet locking mechanism that provides vibration-proof

clamping and 635.6 kg of nominal pressure. The lightweight pipe rolls on tracked wheels and contracts to just 2.29 metres for ease of storage, transportation and handling. Each of the hydraulic stabilisers produces up to 158.9 kg of self-circulating end pressure.

The incorporation of the Sidewinder EXM water cannon gives the ability to deliver a targeted stream via remote control. This allows the operator to use horizontal or vertical movement to reposition the water stream without exposing himself or herself to any unnecessary danger. A further enhancement that is proving popular is to combine the assembly with a high resolution thermal imaging camera. This enables the hottest areas of the fire to be ascertained, chemicals to be detected remotely, and the nozzle to be targeted accurately for the greatest and swiftest effect. The recommended camera for this application is Bullard's T4 Max and digital command centre. **APF**

Jerry Herbst is Strategic Development Manager, National Accounts, at Elkhart Brass

For further information, go to www.elkhartbrass.com



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Terry Goh

and

Kurt Werner

3M

Clean Agent Long-Term Solution

A small fire in critical facilities such as data centres, telecommunication rooms, oil and gas facilities, power generation and transmission facilities, and other computer-controlled operations can result in catastrophic loss. It interrupts vital operations and damages high-value equipment. In these situations, it is important that fires be knocked down quickly before they have a chance to spread. This ensures that sensitive data, electronics and other equipment will not be damaged in the process of putting out the fire.

During the phase-out of Halon fire suppression agents, many began looking into other fire protection options that did not damage the ozone layer. Some of the most popular alternatives to Halon at the time were hydrofluorocarbons (HFCs), including HFC-227ea (such as the FM-200 brand). Even though the ozone depletion potential (ODP) of HFCs is zero, they are potent greenhouse gases. For instance, the global warming potential (GWP)

of HFC-227ea is 3,220. This means it is 3,220 times more potent than CO₂ in its climate impact.

HFCs used in fire suppression have a higher GWP than those HFCs used in other applications. It has been reported in the Proceedings of the National Academy for Sciences that if nothing changes, HFC emissions are likely to be equivalent to 9 percent to 19 percent of global greenhouse gas emissions by 2050.

Regulations on HFCs

It should not be a surprise that there is growing cynicism and differing perspectives in the clean agent fire suppression market regarding the future of HFCs. Undoubtedly there are multiple stakeholders with diverse interests trying to shape the collective understanding in the market. The fate of HFCs has been discussed at length by policymakers and regulators over the past six years, and 2014 marks the year when the fire suppression market has come to a general consensus about the sustainability of HFCs as clean agents.

There are some definitive events unfolding on a global basis that will help the market come to grips with the ultimate fate of HFCs. Although there are regional differences in implementation, these differences are inconsequential for investment decisions, like fire suppression, which need to consider the lifetime of any valuable asset being protected. In parts of Asia, the impact of these regulatory initiatives may be slightly delayed, but for those interested in sustainable investments to protect their valuable assets, there are important issues to be aware of and choices to be made. It may be helpful to add some clarity to the events unfolding in 2014.

make. Because the quota will be in CO₂ equivalents and HFCs sold into the fire suppression market have some of the highest GWPs, this framework does not favour such a move. For example, an HFC producer would consume the same percentage of a quota by making either one ton of HFC-227ea, three tons of HFC-245fa, or five tons of HFC-32. This dynamic will put a substantial amount of uncertainty on the future supply and costs of HFCs sold into fire suppression. Because the fire suppression market already has cost-effective substitutes available, the transition away from HFCs may be more seamless than for other sectors.

United States

On Tuesday, June 25, 2013 President Obama announced the release of a Climate Action Plan. The Climate Action Plan includes a series of initiatives and executive actions that the Obama Administration will pursue to combat climate change.

Within the initiative to reduce greenhouse gas emissions, the plan proposes to reduce the use of hydrofluorocarbons (HFCs) both domestically and internationally through the Montreal Protocol and

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Europe

On March 12, 2014, the European Parliament voted to support a European Commission proposal to cut the use of hydrofluorocarbons (HFCs) 79 percent below average 2009 to 2012 levels by 2030. The European Council has also now approved the law on April 14 and its provisions will begin in 2015. Because HFCs sold into fire suppression have some of the highest global warming potentials (GWPs) relative to other sectors, these HFCs will likely be more severely impacted in comparison to those sold into other sectors.

Impacts of the EU Regulation on the Fire Suppression Market:

- 227ea, HFC-125, and HFC-236fa are targeted in the overall scope of the regulation under the HFC phase-down.
- HFC-23 (FE-13) will be prohibited from being placed on the market after January 1, 2016.
- HFC-3M Novec 1230 Fire Protection Fluid is not impacted by this regulation.

Under the HFC cap and phase-down, HFC-producers will be allocated a production/import quota for HFCs and will have difficult decisions to

promote low-emissions technologies and climate-friendly chemicals. The Environmental Protection Agency (EPA) will also use its authority under the Clean Air Act to encourage private sector investment in low-emissions technology by identifying and approving climate-friendly chemicals while prohibiting certain uses of more harmful HFCs.

The availability of sustainable substitutes in fire suppression allows for U.S. EPA to achieve substantial HFC reductions from this sector. In 2014, U.S. EPA has already announced they will propose a rule in 2014 to change the status of HFCs under SNAP. Status change considerations will be made for individual gases on a sector by sector basis.

Southeast Asia

South-east Asia is highly vulnerable to climate change as a large proportion of the population and economic activity is concentrated along the coastline. Even though the region is not a major source of greenhouse gas emissions, south-east Asia has taken proactive goals and actions to address climate change through various environmental, economic and social activities. These aggressive goals include Indonesia, committing to

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a 26 percent GHG emission reduction from business-as-usual (BAU) by 2020; Malaysia, committing to 40 percent reduction in energy intensity by 2020 compared to 2005 levels; Philippines, reducing 20 percent from BAU; and Singapore, committing to a 16 percent emission reduction below BAU by 2020.

In 2008, Singapore established a national strategy – the Building Control (Environmental Sustainability) Regulations – to mitigate climate change from buildings by imposing minimum environmental standards for all new buildings. Although the BCA Green Mark Scheme has not yet explicitly excluded substances with high GWP, it encourages building owners and occupants to select more sustainable and environmentally friendly alternatives by awarding them Green Mark points for their green choices.

Singapore is focused on implementing green building initiatives, like the Building and Construction Authority (BCA) Green Mark Scheme, because buildings and infrastructures can contribute one-third of the greenhouse gas emissions in a country (United Nations Environment Programme (UNEP), The Emissions Gap Report).

- Use zero ozone depleting potential (ODP) products: non-CFC and non-HCFC refrigerants AND fire suppression clean agents.
- Use fire suppression clean agents with zero ODP and negligible global warming potential (GWP) less than or equal to 10.

It is now widely recognised that sustainable fire suppression technologies are available to replace HFCs in fire suppression. The Malaysian government is recognising the availability of that technology and encouraging its use.

Waiting for the Smoke to Clear?

Mixed messages and contradictions create uncertainty in the market and add a degree of difficulty to business planning. Once you filter through the smoke, the facts regarding policy and regulatory trends on HFCs may not be convenient, but they are really quite clear. In planning the future of a fire suppression business or for the installation of sustainable fire suppression, one needs to consider that today's policy realities suggest a future that severely restricts or financially burdens those using HFCs for their fire suppression solutions.

Not all fire suppression agents are created

Mixed messages and contradictions create uncertainty in the market and add a degree of difficulty to business planning. Once you filter through the smoke, the facts regarding policy and regulatory trends on HFCs may not be convenient, but they are really quite clear. In planning the future of a fire suppression business or for the installation of sustainable fire suppression, one needs to consider that today's policy realities suggest a future that severely restricts or financially burdens those using HFCs for their fire suppression solutions.

The BCA Green Mark Scheme has since established specific standards for certain sectors, including data centres. And because it is recognised that HFCs used in fire suppression have a high GWPs, the BCA-IDA Green Mark for Data Centres awards up to two Green Mark points for the use of fire suppression with an ozone depletion potential (ODP) of zero and a global warming potential (GWP) of less than 100.

Similarly, in Malaysia, the Green Building Index (GBI) has taken significant measures to increase awareness of the environmental impacts of the clean agent fire suppression options available and, in particular, the climate impacts of HFC-227ea and HFC-125. The GBI (according to its latest edition) is an "... environmental rating system for builders ... for evaluating the environmental design and performance of Malaysian buildings ...". As such, the GBI Index, under its "Materials & Resources (MR)" section, has issued the following criteria regarding the use of fire suppression agents:

- Use environmentally-friendly refrigerants and clean agents exceeding Malaysia's commitment to the Montreal & Kyoto protocols.

equal. Fortunately, there has been great progress in the availability of truly sustainable fire protection including 3M Novec 1230 Fire Protection Fluid. Novec 1230 fluid has been commercial since 2002 and is a readily available alternative to immediately replace the use of HFCs in fire suppression, enabling the industry to essentially eliminate its dependence on potent greenhouse gases.

Novec 1230 fluid has an ODP of zero with a GWP of less than one. It does not damage sensitive equipment, paper or furnishings and leaves no residue. It is stored as a liquid, making transportation much safer and easier than HFC gases. This fluid has been widely used in data centres, telecommunications centres, oil and gas processing facilities, electricity generation and transmission infrastructure, as well as archives and museums and other valued assets where continuity of operation is paramount.

Decisions about fire protection need to be for the long term and the type of extinguishing agent used is an important part of that decision. Sustainability has both environmental and economic components. When total cost of ownership is part of the agent selection process, sustainable technology is ultimately the choice.

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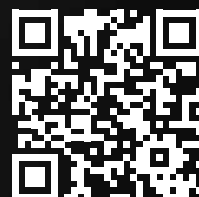


New: Vehicle Extrication Techniques training book by Holmatro

This 256-page training book, written by Holmatro Rescue Consultant Ian Dunbar, promotes a safe, methodical and casualty centered approach to vehicle extrication. Not only does it cover rescue tools and techniques, it also highlights key medical considerations and guides the rescuer through the process of efficient planning. All techniques described in the book have QR codes referring to videos showing how to perform these procedures.

App and posters

The book is part of the new Vehicle Extrication Techniques series, which also includes an app (iPad and Android tablet) and a poster series. All items will be available in multiple languages.



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The United Nations Perspective to Search and Rescue



David Dickson

This article was written on the twenty-fifth anniversary of what many experts consider to be the genesis of international search and rescue operations and it aims to give the reader a perspective of the lead international agency that helps drive the agenda of the global USAR system.



It was on December 7th 1988 that the northern region of Armenia was struck by a magnitude 7.0 earthquake. In a matter of minutes more than 25,000 people had died and the cities of Spitak and Leninakan were reduced to rubble. In the chaotic response that followed, more than 110 countries sent humanitarian aid including medical and search and rescue teams. Much of the aid was not specifically requested; most was uncoordinated both with the Government of Armenia and between responding organisations and agencies.

Following a response that left much to be desired in terms of management and effectiveness, a number of organisations met to discuss how such a response, particularly an initial rescue operation, could be improved. These discussions eventually led to the formation of the International Search and Rescue Advisory Group (INSARAG) [www.insarag.org] and, in turn, to the development of mutually agreed minimum standards for coordinated and principled rescue and relief operations.

Initially comprising of some western European countries, the USA and a few developed countries from the Asia/Pacific region, INSARAG has now

grown to the point where nearly 100 countries and organisations are members of the Group. Membership of INSARAG is open to all countries and/or organisations involved in Urban Search and Rescue (USAR) activities. Countries that plan on receiving USAR assistance if required and countries that plan to build local USAR capacity are as welcome to become INSARAG members, as are countries that already send existing USAR teams overseas.

Since 1988, INSARAG has continuously learned from each disaster that its constituent organisations have attended. Earthquake responses to Turkey, Pakistan, Haiti and, most recently, New Zealand and Japan have been reviewed and the lessons learned have been and are being incorporated into its suite of guidance documents. In 2002, the United Nations General Assembly recognised the valuable work being done and awarded INSARAG its mandate contained within Resolution 57/150. The Resolution is titled, "*Strengthening the effectiveness and coordination of international urban search and rescue assistance*" and gives INSARAG and its members a clear and unequivocal mandate in their work towards disaster preparedness and response.



A Steering Group comprising members selected from its constituent countries and organisations directs the work of INSARAG. It is supported by a full time Secretariat, which is hosted in the Field Coordination Support Section (FCSS) of the Emergency Services Branch (ESB) of the United Nations Office for the Coordination of Humanitarian Affairs (UN-OCHA) in Geneva. The steering group is made up of representatives from the three regional groups – Americas, Asia/Pacific and Africa/Europe/Middle East. Whilst the Steering

Group decide policy, representatives from the international search and rescue team leaders decide on operational procedures and standards.

The major achievement of INSARAG as an organisation is the development and almost universal adoption of a suite of guidance documents and coordination tools that inform and assist organisations, and indeed countries, in the prosecution of international rescue and humanitarian relief operations.

The core guidance document is the 'Blue Book'

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or INSARAG Guidelines, the underpinning methodology appropriate for all international USAR operations. Adopted 'de facto' by most of the major response organisations, including the European Union Civil Protection Mechanism and the US Federal Emergency Management Agency, the Guidelines set out the roles and responsibilities of countries and organisations, advise as to minimum standards for capability and ensure standardised structures and procedures amongst international USAR teams.

The basic function of the Guidelines is to set the 'minimum standards for international operations', and these standards are expressed in terms of performance and outcomes. Therefore, it is the responsibility of each team to select their equipment, techniques and operating systems as long as these meet the minimum standards required in terms of capability. For example, penetrating through a concrete floor to reach a victim trapped below can be done using a variety of equipment and techniques. The INSARAG Guidelines do not dictate how this should be done, but they do establish the expected parameters of the operation such as specifying concrete dimensions, safety considerations, supervision, logistical and medical requirements.

The INSARAG Guidelines recognise three levels of USAR capability.

First responders such as firefighters, EMS practitioners and members of volunteer groups typically demonstrate:

- **USAR Awareness.** In the UK, Fire Rescue Service (FRS) crews, paramedics or trained voluntary sector personnel, would represent this level of capability.
- **National USAR Teams** are usually of Light, Medium or Heavy capability and work with their own national response system. The National Resilience USAR teams are probably the best examples of this within the UK response system.
- **International USAR Teams** are of Medium or Heavy capability and operate under the principals of self-sufficiency and air mobility whilst adhering to the minimum operational standards stated within the INSARAG Guidelines. In the UK, this level of capability is represented by UK-ISAR, a team created from selected FRS and supported by the Government in the form of the Department for International Development (DFID).

Medium International USAR teams must have the capability to perform all search and rescue evolutions, maintaining continuous operations at one site for the duration of the rescue phase. This would include the capacity to locate trapped victims under debris, provide appropriate medical care, release them and recover them to a place of safety. The team must be capable of being transported by air, whilst also being self-sufficient in every way. Typically, this requires a minimum team of 38 to 40 personnel, including management, logistics, medical and search and rescue specialists.

Heavy International USAR teams must have all the abilities and capabilities of a Medium team and the additional capacity of being able to operate simultaneously at two sites for the duration of the rescue phase. Inevitably, shift operations at two geographically separate sites have significant consequences, requiring a much larger team size. INSARAG Heavy teams typically comprise of 55 to

70 personnel, with a subsequent increase in the amount of equipment required to support search and rescue operations.

Uniquely amongst international humanitarian relief operations INSARAG provides countries, struck by disaster and needing to request international assistance, a degree of operational assurance. Through a system of peer review, any team within the INSARAG system can be classified as meeting all the requirements of the INSARAG Guidelines, including capability and self sufficiency. Such a system allows countries affected by earthquake, typhoon or tsunami to separate out the many disaster tourists and restrict access to only those teams that are both competent and effective and will work within the accepted humanitarian methodology. So popular and effective has the INSARAG External Classification (IEC) system been proved that other sectors of the humanitarian relief community such as health, water and sanitation

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INTERNATIONAL SEARCH & RESCUE



tion, coordination and information management among international humanitarian agencies and links into the national response system of the affected country. During a response to any large and complex earthquake the OSOCC is now supported by a dedicated USAR Operations Cell, which coordinates the rescue operations of international teams and provides information and advice to the affected country via the OSOCC structure.

tion are now looking to replicate this system and provide both donors and recipients with some confidence that aid agencies can actually deliver what they claim.

As the reader might remember, I mentioned previously that, in addition to the INSARAG Guidelines, the organisation has been responsible for developing a number of coordination tools and methodologies that guide international rescue operations.

Firstly, the On-Site Operations Coordination Centre (OSOCC) provides a platform for coopera-

Secondly, the Reception/Departure Centre (RDC) at the entry points into the affected country helps to better coordinate team assignment and logistics support during rescue and relief operations. USAR teams within the INSARAG methodology are required to train personnel to staff an RDC and to support the functions of an OSOCC or USAR Operations Cell.

Finally, the establishment of an on-line hub for real-time information exchange during ongoing emergencies. The Global Disaster Alert and Coordination System (GDACS) [www.gdacs.org] alerts

Suzanna
(64 years old)
Rescued from the rubble of her wooden house in the aftermath of a storm in October 2012

Lani
(23 years old)
Survived an earthquake in November 2013 thanks to Scorpe Technologies

Kusumo
(44 years old)
Found alive under his broken house after a tsunami in Indonesia in 2013



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users to an earthquake within minutes of the impact and provides them with an assessment of the likely impact on the local population. GDACS also allows responding INSARAG teams to exchange information and coordinate with each other, with other humanitarian organisations and with the affected country.

The positive response from the international humanitarian community to the INSARAG Guidelines and the supporting coordination tools is highly encouraging and will lead to better coordinated rescue and relief operations, which in turn, will lead to more lives saved.

Whilst front-line responders working within national systems such as CFA-led National Resilience programme in the United Kingdom may not immediately appreciate the influence that INSARAG has had on the development of their systems of work and methodologies, such influence has undoubtedly been significant.

The aim of INSARAG is to remain an influence in both international and national USAR operations, ensuring that all countries benefit from the shared knowledge and experience of its members. Significant work has already been done in developing an international 'operational assurance' methodology based on minimum standards, the IEC system. This system will be further refined and may prove a model for some national authorities as they seek to develop and assess their own USAR capabilities. INSARAG, in this era of global recession, is also tackling the matter of the cost effectiveness of USAR response, by looking at how USAR teams can be more widely used in disaster situations. While this means that USAR teams need to be prepared to undertake activities outside of the traditional 'life saving' role, there is already evidence from recent disasters that USAR teams can prove highly effective in supporting communities in the initial recovery phase following a disaster.

Another key challenge for the USAR community is the capture, analysis and effective use of information (sharing). In the age of the smart phone, crowd-sourcing and the cloud, quantity of information about a disaster is no longer an issue, indeed the challenge for responders is to avoid being overwhelmed by information. INSARAG is working with other humanitarian relief organisations to develop shared tools and methodologies that will be available to all and shared by all, so that international and national disaster response continues to improve and develop.

INSARAG has played a pivotal role in the improvements that we have seen in the last 25 years and will continue to play a role in the future development of urban search and rescue. **APF**

David Dickson is a Director of Civillence Limited. He was the National Coordinator for the UK International Search & Rescue Team (UK-ISAR) and worked for the UK Government to develop a national urban search and rescue capability in the UK Fire and Rescue Service. He has worked for both the UN and European Union Civil Protection (EUCP) and has considerable experience of the US system of disaster response, working for Texas Engineering Extension Service (TEEX) as International Project Coordinator.

For more information, go to www.civillence.com

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Graham Collins

PPE Kit Update

What's New in Helmets, Boots & Gloves?

With firefighting and rescue operations becoming ever more challenging, the leading helmet, boot and glove manufacturers are continuing to introduce new and improved products, often tailored to particular fire or rescue challenges and environments. They all share the same vision: improved safety, wearer comfort and long service lifetime, as this review of the latest offers shows.

New Gallet Helmet from MSA

The new Gallet F1 XF fire helmet from MSA is designed with firefighters' needs in mind and is the fifth generation of the F1 Helmet.

MSA says that it offers a perfectly balanced fit and comfortable headband. The headband comes equipped with a ratchet knob and is available with leather or textile paddings, plus numerous intuitive adjustments ensure an ergonomic fit on different wearer profiles. An impact liner with extended coverage offers improved impact protection in the most demanding structural firefighting conditions.

The face shield offers exceptional coverage and field of vision and is available in clear and metal-coated versions, with certified anti-fog and anti-scratch characteristics. An optional ocular visor with dual pivot system for effective eye protection is adjustable to fit any face shape, even when using corrective eyewear.

ATEX-approved, easy-to-install accessories provide protection in potentially explosive environments. These include Integrated proximity lighting that has an innovative two area light distribution to provide improved visibility in poorly lit environments; a bracket is available for external lamps. Other accessories include helmet-mounted MSA headsets with bone conductive or noise cancelling boom microphone, plus connection to a wide range of radios through push-to-talk (PTT), and integrated earmuffs with level dependent attenuation and communication capabilities.

The modular helmet design allows for quick and easy inspection and maintenance, dramatically reducing the cost of ownership over the life time of the product, and is available in two sizes. Customisation options include multiple colours, printed or metal badges and reflectants to identify rank or function. The helmet is approved according to EN443:2008 for structural firefighting, visors according to EN14458.



For more information, go to www.MSAsafety.com

Rosenbauer's Twister Boot



Described as "the boot for all operations", ROSENBAUER's Twister-cross is a short firefighting boot with special features. It was developed specifically for the requirements of fire departments and rescue personnel and is claimed to be the only boot with boot height C that is certified for all firefighting and rescue operations according to EN 15090:2012 F2A HI3 CI AN SRC. The Twister-cross gives emergency response organisations the right boot for all missions, with optimised protection and "unparalleled" wear comfort in every situation.

Although only about 190 mm in height, the Twister-cross reflects the highest protection class for firefighting operations and is one of the few low-cut boots that is also suitable for inside fire attacks. Ankle protection, steel inserts, and the steel toe caps protect the feet against injuries. Reflective elements in the visible area offer maximum visibility, even when worn with protective trousers.

Two flex zones made from soft, grained leather and comfort padding ensure maximum wear comfort. The Sympatex membrane and hydrophobic waterproof leather make the Twister-cross waterproof and give it optimised protection against viruses, bacteria, and bodily fluids. A pair weighs approximately 2.2 kg (size 43).

For more information, go to www.rosenbauer.com

SMP Glove from Pac Fire

PAC FIRE's new SMP structural fire glove was launched late last year into the Australian market. It features a

new Crosstech glove insert with X-Trafit product technology for superior tactility and dexterity.

The new Crosstech glove insert provides durable protection against blood and body fluids and against EN659/NFPA chemicals and other contaminated liquids in combination with waterproofness and breathability.

A new fibreglass knuckle protector is added to reduce compression burns. The new Kevlar thermal liner makes for easy donning and doffing and the glove has the ability to stand up to multiple washes without shrinking or becoming stiff. ESKA's liner retention system virtually eliminates the liner being pulled out. It has an extra wide wrist opening standard in the larger sizes to assist for easier on/off. The glove is currently AS/NZ 2161.6 Level 3 certified and is in the process of being certified to AS/NZ

2161.6:2014 edition. The new standard is designed to allow manufacturers to develop gloves with greater dexterity and higher protection thresholds.

For more information, go to www.pacfire.com.au

Award-winning Dräger Helmet

The DRÄGER HPS 7000 helmet, winner of one of the prestigious iF Product Design Awards 2014, was launched last year and, the company says, represents cutting edge ergonomic design with a strong emphasis on comfort and safety.

As a flexible piece of equipment, it is even possible to equip the HPS 7000 helmet with different lamps, visors and various other accessories, making it strongly adaptable. It can, if required, also be customised to an individual association.

For more information, go to www.draeger.com



New Safe Grip Glove from Rosenbauer

The new Safe Grip 3 firefighting glove from ROSENBAUER ensures protection, optimal wear comfort, and good dexterity and is certified according to EN 659:2008, fulfilling the highest requirements for heat- and flame-resistance and cold insulation.

Safe Grip 3 gloves are constructed from proven materials like Gore-Tex X-Trafit membrane for simultaneous waterproofing and breathability.

These gloves possess improved mechanical protection properties and comply with the high EN 388 Level 4 for cut resistance. The reinforcing material provides for greater tactility and therefore a more precise tactile sensitivity, for example, when gripping. The gloves are available with a dark blue or sand-colour outer shell.

For more information, go to www.rosenbauer.com



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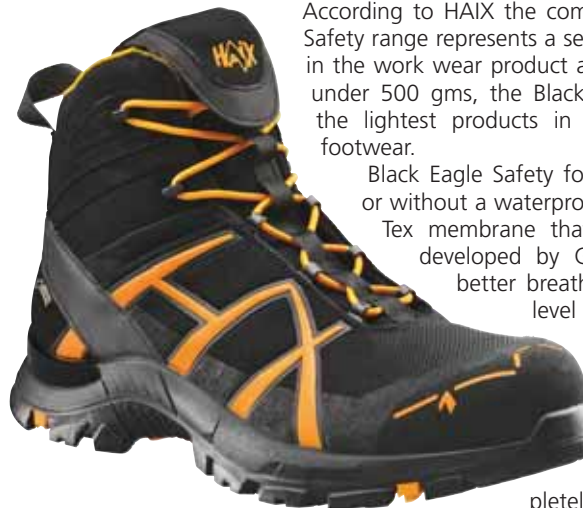
Trio of Helmets from PAB Akrapović

PAB AKRAPOVIĆ has unveiled three new helmets this year.

The PAB MP1 is a multi-purpose helmet that is said to offer high standard of protection and comfort with accessories that increase the possibility of customisation and is designed for wildland firefighting and rescue operations. The PAB Fire Compact is an extremely light helmet with integrated flip-down visor. It is made of thermoplastic and is being promoted as a completely new design providing a high degree of protection. The PAB Klassik is claimed to be the ultimate helmet for professional and volunteer firefighting, offering a high standard of protection and comfort with accessories that increase the possibility of customisation.

For more information, go to www.pab-buzet.com

New Haix Black Eagle Safety Boot



According to HAIX the company's new Black Eagle Safety range represents a sensational new departure in the work wear product area. Weighing in at just under 500 gms, the Black Eagle Safety is one of the lightest products in the field of protective footwear.

Black Eagle Safety footwear is available with or without a waterproof and breathable Gore-Tex membrane that uses a new material developed by Gore that delivers even better breathability and a maximum level of climate comfort. A

new high-tech composite toe-cap makes a major contribution to the outstanding lightness of these shoes, which are completely free from metal and

ESD-certified.

A number of colour choices and basic models in various materials – textile or leather – and different upper heights ensure an attractive appearance and plenty of variability. All models come in sizes three to 15. The individual versions are available in S1P or S3 Standard.

For more information, go to www.haix.com



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Pac Fire's New AS/NZ Certified Helmet



PAC FIRE AUSTRALIA has introduced what it describes as: "the world's first and only F10 Euro style helmet certified to AS/NZ4067:2012". The helmet was designed for Australian conditions in several different combinations to suit different operational requirements.

The new F10MK3 Kevlar helmet features internal "one touch" eye protector, internal PESU visor, optional identification plinth, torch bases attached, optional BA clips, new accentuated longitudinal crest, and lightweight construction 20 percent lighter than composite plastic. It is available in more than 20 colours.

For more information, go to www.pacfire.com.au

New HIS Rescue Helmet

The Cromwell ER1 rescue helmet and integral goggle from HELMET INTEGRATED SYSTEMS is declared as combining the highest standard of protection with comfort when worn for extended periods, and adaptability for a wide range of situations ranging for road traffic accidents and building collapse to natural disasters.

Additionally, the Cromwell ER1(3) CBRN helmet derivative forms part of the current UK Police CBRN protective clothing and equipment kit. Selected following an extensive trial by the Police National CBRN Centre, through the Operational Response Programme, the CBRN helmet was comprehensively tested to ensure that it would not interfere with the protective face seal between the wearers face, the respirator and the hoods of NBC protective suit.

Manufactured from heat and high-impact resistant thermoplastic, the rescue helmet is fitted with an integral 'flip up' polycarbonate optically correct goggle eye protector, adjustable chin strap and headband. A major feature of the 800 gms helmet is the range of adjustment options that enable it to be worn by all head sizes, and provide for interfacing with other items of protective equipment, such as respirators and hearing protection.

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Trio of Boots from Pac Fire

YDS/Goliath and PAC FIRE AUSTRALIA are releasing three new fire boots. The "all new" Hades Crosstech lined structural boot, the new Ignis non-Crosstech structural/wildland boot and the new Apollo wildfire/rescue boot. All the new boots are certified to the relevant Australian fire standards and EN footwear requirements, and are made to the high YDS quality standards to meet Australian operational fire requirements.



All are made on a new wider last and feature sizes three to 15 and new dual-density injected rubber soles have moulded scuff caps to cover the front of the boots with no stitching or joins to come away from the boot. Other features include, "Tex" nail-proof protective midsoles, comfort inner foot pads, padded ankle protection and rugged construction to survive the toughest operational situations.

The Apollo features a new easy-to-operate fast lace extraction system, Tencate waterproof fire retardant cloth inserts to assist in cooling the interior of the boot. The Apollo is made on the same wide last as the Ignis and Hades featuring the moulded scuff cap. This boot is extremely lightweight but constructed to meet the demands of the Australian rural fire operations.

The new Ignis boot features a S3 waterproof, hydrophobic fire retardant breathable upper leather outer and conforms to EN15090:2012. A Coolmax quick drying liner assists in sweat management. The Hades and Ignis feature a special cut resistant strip running along 35mm line to protect from punctures and lacerations. This is in addition to the textile mid sole.

For more information, go to www.pacfire.com.au

Pro-Tech Structural Gloves



According to PRO-TECH, its Pro-Tech 8 is the only glove design that strategically reinforces protection in the areas where hands are most vulnerable, while simultaneously allowing the most flexibility, best dexterity and strongest grip of any NFPA 1971 compliant structural firefighting glove.

The gloves use multi-layered, flame resistant Kevlar and Nomex and do not rely on bulky, stiff leather for protection. The end result is more protection where it is needed most while maintaining dexterity and reducing hand fatigue for efficient gloves-on performance through all fire ground tasks.

The dexterous Pro-Tech 8 Fusion structural firefighting glove breaks in immediately and remains soft and flexible after use. The Fusion features the unique Pro-Tech 8 multi-layer knuckle guard system to protect this known vulnerable area and incorporates a textured mesh knit inner liner for efficient don and doff performance. Pro-Tech 8 Evolution is the latest addition to the Pro-Tech 8 structural firefighting glove line-up. This glove uses the unique Pro-Tech 8 advanced multi-layer design while adding a rubberised layer to the palm side for enhanced durability, a silicon coated steam blocker and an extra reinforced cut level 8 knuckle guard for advanced durability and protection. The inner liner features dimpled Kevlar for easy wet don and doff.

All Pro-Tech 8 structural firefighting gloves are complaint to NFPA 1971-2013.

For more information, go to www.techtradelc.com

Rosenbauer Heros Helmet



ROSENBAUER's Heros-xtreme firefighting helmet has been fully tested and certified according to EN 443: 2008; it is already certified according to two new standards – prEN 16471:2013 for forest and land firefighting, and prEN 16473:2013 for technical rescue.

It features a high heat- and impact-resistant shell, simple external head-adjustment mechanism, and attachable lamp. Generous internal padding maximises wear comfort and prevents pressure points, even when worn for extended periods of time. The fully integrated lamp is equipped with cutting-edge LED technology, two brightness levels, and explosion protection. Two visors – a large face shield or eye shield – ensure optimal protection in every situation. Neck protection made of heat- and flame-resistant material is a standard feature. Heros-xtreme is available in several different colours: luminous, high-visibility red, high-visibility yellow, blue, black, white, silver, and red.

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Why Standards are



Simon Burnett-Boothroyd

Hainsworth

Simon Burnett-Boothroyd will be among those taking part at the ISO TC 94 SC 14 in Sydney. In addition to this particular ISO committee, he also sits on PPE firefighter clothing committees for BSI and CEN. Hainsworth was invited to join each of the committees and the company was actually involved in the origination of some of the standards committees. In Simon's job he meets regularly with firefighters in the UK and abroad.

Standards are published documents setting out the specifications and procedures designed to ensure products, services and systems are safe, reliable and consistently perform the way they were intended to. In July this year, a global standards committee with the not so catchy title of ISO TC 94 SC 14 (Firefighters' Personal Equipment) will convene in Australia.

The impetus for the creation of standards committees came about because of concerns over the quality of some performance products entering the global firefighting market which, over the years, had been linked to certain fatalities.

The King's Cross fire at the King's Cross underground station in London in 1987, which cost the lives of 31 people including one firefighter, was one of the most significant milestones on the road towards the advancement and better standardisation of firefighter PPE. With the publication of the EU Directive on PPE in 1989, the PPE market in the EU was opened and harmonised and gave rise to the creation of European Standards.

This led to the introduction of European Standard EN 469 (Protective Clothing for Firefighters) that enshrined in law the need for garments to undergo a number of tests to ensure they provided adequate protection against both radiant and convective heat. In addition, they must also meet the requirements for resistance against water penetration and tearing.

Increasing focus on the issue of heat stress – considered to be the biggest threat to the safety of firefighters – resulted in the introduction of various standards in recent years. These include the incorporation of water vapour resistance testing into EN469:2005, the introduction of a physiological Annex F into the latest revision of EN469 and the development of the sweating articulated manikin test method ISO 15831:2004.

Heat stress can not only imperil the life of a firefighter but, on a more day to day basis, can seriously harm someone's decision-making ability which, in turn, potentially puts the lives of colleagues on the line. The body's internal core temperature is closely regulated and remains within a very tightly defined range from approximately 36°C to 38°C. This temperature range is maintained by controlling the equilibrium between the amount of heat the body produces through physical activity, the amount of heat stored by the body and the amount of heat lost to the surroundings through sweat evaporation and heat radiation,

so Important

convection and conduction aided by vasodilation.

When the ambient temperature of the surroundings rises to above 35°C, heat loss through radiation, convection and conduction stops and the only way left for the body to cool itself is through sweat evaporation. This will also stop if the heat and humidity becomes excessive, causing the body to store the excess heat generated and produce a rise in the core body temperature. The manufacturer's role is to find the right balance between maximum protection as well as durability, comfort and breathability.

The standards that are set by the various committees around the world should be seen as the minimum performance requirement and there is an expectation that companies operating in the PPE sector will strive to manufacture and innovate above this level.

The work of the committees can be fascinating and, due to the nature of modern technologies, fast changing. It is manufacturers' responsibility to ensure that the products available in the market do what they say they do, and that they are as sure as they can be that every time a firefighter puts on his or her kit it will perform to the required standard.

It is not unusual to hear from firefighters that they do not really understand how the standards process works both in the UK and around the world. Something Hainsworth believes in passionately is the need to provide end users with as much information as possible to help them understand the structure and, ultimately, the capabilities of their kit.

The modern PPE is so far removed from the woollen tunics that were still being worn by firefighters tackling the blaze at King's Cross more than 25 years ago. The kit is more integrated and intelligent than it has ever been, which means that firefighters are afforded the best possible protection. Because the levels of protection are so sophisticated it increases the importance of firefighters understanding what their kit will not allow them to do.

It is the role of standards committees to review published standards every five years to ensure that they remain totally relevant to the operational needs of firefighters in different parts of the world, whether they are structural or wildland.

As the international standards organisation, ISO is seeking to create global standards, while the National Fire Protection Association (NFPA), BSI, CEN and AS/NZS are focussed on ensuring that their standards totally meet the requirements of firefighters in their regions. The same is the case for other countries in the world, such as Japan and China, which have their own standards committees. You will also see countries adopting standards from other parts of the world, for example it is not uncommon for a country such as Brazil to adopt NFPA standards or for China to specify a CEN standard.

The meeting of ISO TC 94 SC 14 in Sydney at the end of July will bring together more than a dozen countries and will be an opportunity to share knowledge from different parts of the world



and ensure that the ISO standards for firefighters' personal equipment meet the needs of today's firefighter. Among the issues that have been evaluated in the past year is whether manikin testing of firefighter PPE should be adopted into the standard.

The way in which standards are created, implemented and reviewed works as well as they can ever work when you have to take into account the views of different countries, many of which operate in very different firefighting environments.

The committees on which Hainsworth is fortunate to sit are working to ensure a level playing field for those whose job it is to develop modern firefighting PPE, while at the same time locking in genuine quality controls through published standards. The consequences of not complying with PPE standards laid down by many of the world's standards committees are severe with the threat of prosecution a very real threat.

When the ISO TC 94 SC 14 committee convenes in July, each member will be in no doubt about the responsibilities that have been entrusted to them. Central to every discussion that takes place and decision made will be the need to ensure that firefighters across the globe are wearing PPE kit that will enable them to return home safely to their loved ones at the end of every day.

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Simon Burnett-Boothroyd,
Sales and Innovation
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Graham Collins

New Vehicles on the Scene

The Asia Pacific region continues to be particularly active as far as new firefighting vehicle deliveries are concerned, with the leading manufacturers scoring successes across the region, from Australia and New Zealand, China and Japan, to Taiwan and Indonesia.

Sasgar Delivers the Ultimate Firefighting Power



The new Santos heavy pumper is described by Sasgar as being one of the most powerful extinguishing firefighting vehicles in Australia

Australian company, SASGAR FIRE AND RESCUE, has delivered a Rosenbauer SLF 4000/2250 HRET 8x8 heavy pumper – which Sasgar describes as one of the most powerful extinguishing firefighting vehicles in Australia – to Santos, the Australian oil and gas exploration company. It is in operation at Santos's Moomba plant in the Cooper Basin in South Australia.

The new Santos vehicle is designed to deal with the most hazardous emergency situations with the capacity to deliver 15,000 litres of water and 4,000 litres of foam in less than two minutes. Other impressive operating features that improve firefighter safety include the remotely controlled RM 60 foam/water roof monitor that can discharge up to 6,000 litres a minute and reach an extinguishing range using foam of up to 90 metres.

The monitor has a movement range of 180° in both the horizontal and vertical directions, and the nozzle has an infinite stream adjustment from straight to spray stream. The monitor on the Santos vehicle has the ChemCore option to provide a concentric powder stream in the water stream, greatly improving the throw range for dry chemical powder. The powder is delivered to the nozzle through a telescoping pipe with minimum friction loss and is insensitive to clogging.

A Rosenbauer Stinger High Reach Extendable Turret (HRET) can reach a vertical height of 20 metres, a straight stream throw of 65 metres and discharge up to 4,900 litres a minute, providing extensive fire coverage. The movement range of the Stinger boom, turret and piercing tool covers all required attack positions. The horizontal rotation of the HRET is a total of 60°-30° left and 30° right – without the need for outriggers.

The vehicle is equipped with a Rosenbauer N100 single-stage, normal-pressure pump that has high water discharge rates of up

to 15,400 litres a minute. There are eight 65 mm outlets and two 125 mm outlets on each side of the vehicle.

The Santos vehicle is also fitted with LED scene lighting, wireless camera display on the HRET, rear-view camera with colour monitor, and the Rosenbauer "Service 4 Fire" vehicle management system. This enables remote system diagnostics, automatic notifications about the vehicle's condition, and automatic detailed reports on vehicle systems along with many other features.

This year, Sasgar has also delivered four new Rosenbauer Panther aviation firefighting vehicles to Auckland Airport Emergency Services in New Zealand, and two new Rosenbauer Panther VO 6x6 ARFF vehicles to the Wellington Airport Fire Service.



The Rosenbauer SLF 4000/2250 HRET 8x8 heavy pumper is designed to deal with the most hazardous emergency situations

For more information, go to www.sasgar.com.au and www.rosenbauer.com

Oshkosh Strikers Score in Asia Pacific

In the past year alone OSHKOSH AIRPORT PRODUCTS, which designs and builds airport rescue and firefighting (ARFF) vehicles has delivered over 50 Striker vehicles to customers in Japan, Taiwan, China, and Asia Pacific countries such as Indonesia.



In the past year Oshkosh delivered over 50 Striker vehicles to customers in the Asia Pacific countries



This Oshkosh Striker 6X6 is loaded with advanced chassis technologies

The Striker ARFF is available in three axle configurations (4x4, 6x6 and 8x8 models). The Striker 6x6, for example, features TAK-4 all wheel and fully independent suspension and the 697 hp, Tier 3 Deutz engine is mated to a seven-speed electronic automatic transmission for smooth power delivery enabling acceleration from 0 to 80 kph in less than 32 seconds.

The 6x6 ARFF vehicle's firefighting system includes a 11,356-litre water tank, a 1,590-litre foam cell, and a 249 kg dry chemical system for dual agent fire suppression capabilities. The apparatus is available with a roof turret, bumper turret, and a Snozzle high reach extendable turret (HRET). A structural firefighting package is available with water intakes, discharges, and pre-connected hoses on both sides of the vehicle. The engine power pack components are readily accessed through walk-in doors on either side of the engine compartment.

For more information, go to www.oshkoshairport.com

Pierce Performance Favoured in China



Over the past year, Pierce delivered over 30 vehicles to China, including this aerial platform truck

The PIERCE MANUFACTURING offering for the municipal and industrial fire services includes custom pumpers, aers, rescue trucks, wildland trucks, mini-pumpers, water tenders, and command vehicles. Over the past year, the company has delivered over 30 trucks to China, including high-rise pumpers, heavy duty rescue trucks, heavy duty industrial pumpers, and ladder and platform aerial trucks.

Earlier this year Pierce unveiled an all-new Pierce Saber and Pierce Enforcer custom chassis. According to Pierce, the new Saber custom chassis retains the simple, straightforward, and durable features for which it has long been known.



This Pierce Aerial Ladder vehicle is on duty in Changzhou, China

The new Pierce Enforcer comes with either medium-block engines or the Pierce-exclusive DD13 big-block engine with up to 500 hp for extra power and torque on demand. Pierce's TAK-4 independent front suspension – never before available on 260 mm deep frame rails – is available for a more confident ride. The Pierce Enforcer platform supports a wide range of apparatus configurations.

For more information, go to www.piercemfg.com

Magirus Dragon Breathes New Life

MAGIRUS has unveiled what it describes as a complete new generation of customised aircraft rescue and firefighting (ARFF) vehicles with performances that exceed current ICAO and NFPA requirements.



The performances of the latest Magirus vehicles exceeds current ICAO and NFPA requirements

The modular structure makes it possible to create different configurations and drive variants. These include a 4x4 on a two-axle chassis, a 6x6 on a three-axle chassis, and an 8x8 on a four-axle chassis with single motorisation and with twin engine power pack (TEP) drive system. This is based on powerful Iveco engines or, as an option, a Deutz engine.

The 6x6 and 8x8 Dragon chassis with a twin engine power pack solution drives the vehicle and the fire pump and results in better performance than the single engine solution. The two electronically controlled Iveco Cursor 13 engines provide a total power of 1,080 hp in the Euro 3 or 1,120 hp in the Euro 5 version.

The new ARFF chassis was developed in house and all of the innovations were developed specifically for this range. These include: drive train; extinguishing systems; controls and bodywork design perfectly matched to the chassis.

The new driver cab provides space for three, four or six people, with up to four with breathing apparatus. The driver seat can be positioned on the left, right or in the centre. Vehicle entry is ergonomically designed for firefighting operations and large, lowered windows provide optimal visibility in all directions.

For more information, go to www.magirusgroup.com

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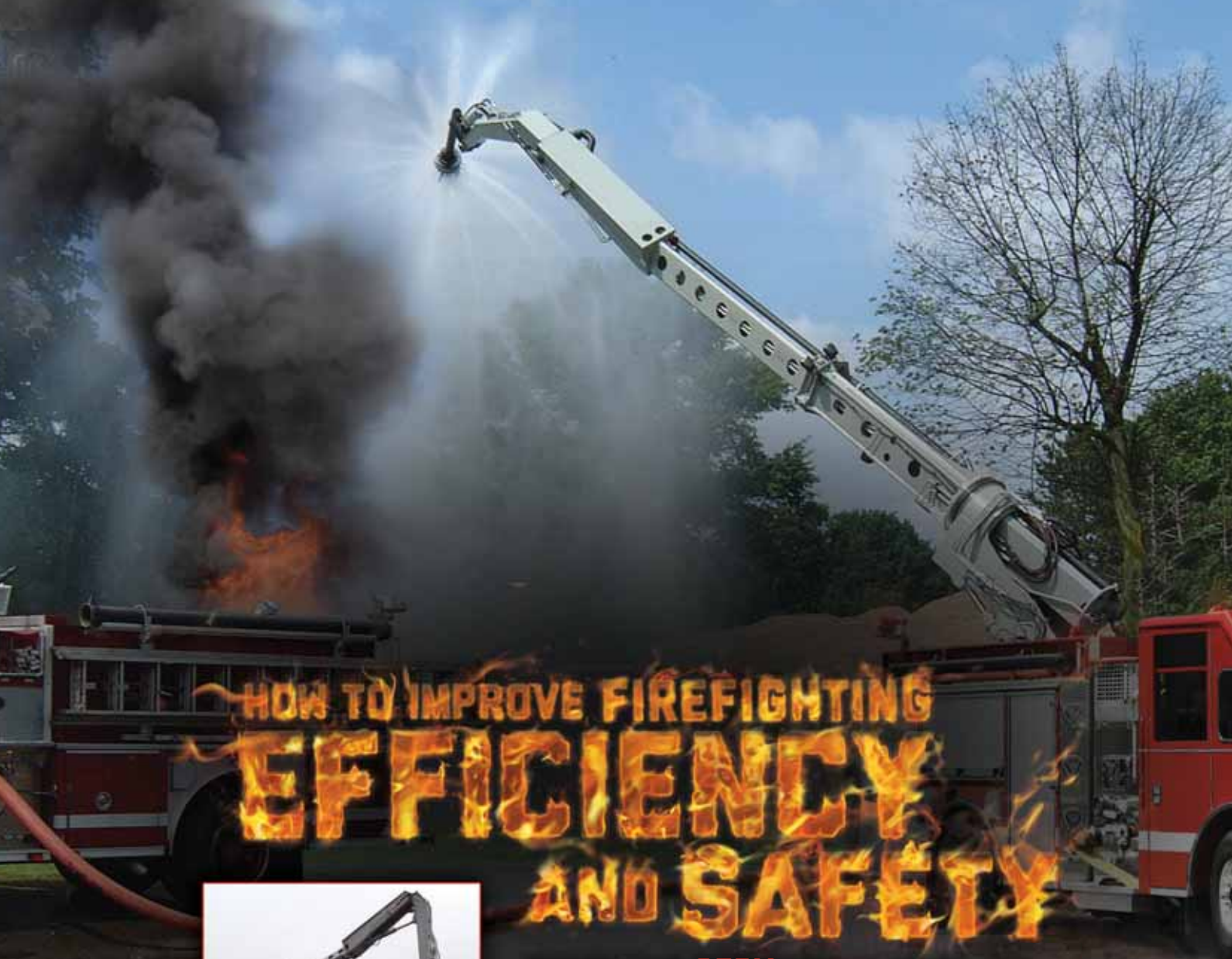
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Factors Relating to Knowledge Retention



Neil Bibby

Vector Command

You have just finished a training course – whether it was a part or full time, one week or one year – from the moment you pat yourself on the back, the knowledge and/or skills you received in those studies will start to decay. What can you do about it? The first thing is to understand what is going on in regards to why we do not retain all that we learn. So, we will look at the factors around skill decay to give you an understanding that this is not just a matter of forgetfulness and how to mitigate against it.

Skill decay refers to the loss or decay of trained or acquired skills (or knowledge) after a period of non-use. Skill decay is salient and problematic in situations where individuals receive initial training on knowledge and skills that they may not be required to use or exercise for extended periods of time. Reserve personnel in the military, for example, may be provided formal training only once or twice a year, when called up for active duty. Yet, it is expected that they will need only a limited amount of refresher training, if any, to reacquire any skill that has been lost and subsequently to perform their mission effectively. This is nothing new and very applicable to emergency services; in summary 'use it or lose it'.

A quick literature search throws up many examples of skill decay and we will quickly touch on one by Compton and Chien 'Factor Relating to Knowledge Retention after Crisis Intervention Team Training of Police Offices' 2008.

Critical Intervention Teams (CIT) are used to defuse and stop the criminalisation of individuals with serious mental illness and team members attend a 40-hour course composed of lectures, visits and practical training. A survey was used to test participants going back three years and, as expected, knowledge scores decreased significantly in the months after the CIT training. Less experienced officers had a lower follow-up scores. The findings indicated that CIT officers would benefit from continuing education and that the more seasoned officers may be better candidates for CIT training, at least in terms of knowledge retention.

Work done on computer-based training by Reid, Jacobsen and Katz 'Knowledge Retention in Computer-based Training with Adult Learning' showed the following drop off. In 60 days you are almost back to where you started. This is

of particular concern when being trained in life and death situations.

From the CIT example you will see that there is more to it than your individual memory. I touch on five of these factors for you to take into consideration when thinking about skill decay.

1. Retention Intervals

This is the effect on knowledge or skill deterioration when knowledge and skills are not used or exercised for a period of time. It is very clear that time is an enemy of knowledge. As an example how many of you will relate to the loss of a language learned at secondary school if it is not used in day to day life?

2. Degree of Over Learning

Over learning provides additional training beyond that required for proficiency. This appears to be one of the single most determinant factors. The emergency services have a propensity to fill up the available space. Matter experts sometime lose sight on the training outcome particularly at the lower level of training. If the outcome is to teach a student CPR, do not add in defibrillators until the base skill CPR skill is imbedded, or risk losing both.

3. Task Characteristics

Another set of variables that influence the retention and decay of skills and knowledge is the



characteristics of the task being learned. These tasks differ considerably in terms of difficulty, complexity and level of integration and include:

- **Closed-loop versus Open-looped tasks**
A closed loop task is one such as a pre-flight check and other fixed sequence tasks usually involving discrete responses that have a definite beginning and end. On the other hand an open loop task such as tracking and problem solving do not have a defined beginning and end. It has been found generally that closed loop tasks decay more rapidly than open loop tasks.
- **Physical versus Cognitive Tasks**
Physical skills are those requiring activities such as muscular strength, exertion, endurance and coordination. Cognitive tasks on the other hand involve perceptual input, mental operations, problem solving and decision making. Although mental practice was effective for both cognitive and physical tasks, the effect of mental practice on retention was significantly stronger for cognitive tasks. Mental rehearsal is considered practice of knowledge and skills.
- **Natural versus Artificial Tasks**
These differ in two main ways that may affect retention, namely complexity and motivation. Natural tasks are usually more complex and integrated into the day to day experience of the student; natural tasks also have the participant's genuine interest in acquiring and retaining the proficiency. Natural tasks include; instrument flying, simulated events like a lunar landing, and managing emergency service situations. Artificial tasks include problem solving, mazes, gymnastic skills such as balance. It is generally found that natural tasks retain skills and knowledge better than artificial tasks.

4. Speed versus Accuracy

Learned tasks that require speed and those that require accuracy are easy to measure but difficult to compare. However, NASA in looking at space-flight skills found that the ability to perform motor tasks in a specified period of time tend to deteriorate more rapidly than performance accuracy.

5. Individual Differences

The last point to be taken into consideration in the complex issue of knowledge and skill decay in the individual. Individuals have their own learning ability and it is generally found that higher ability individuals retain more knowledge over a period of non-use than lower ability individuals. It is also found that higher ability trainees acquire more knowledge, skills, or both in the same amount of time than the lower ability trainees. There is also some evidence that lower ability trainees forget larger portions of abstract, theoretical material than do higher ability individuals.

Although there are many ways of testing the above factors, and they may give different results, the basic premise is that skills and knowledge decay over time. Many factors show that the level of decay is different depending on the training program; what was learnt and how it was learnt. Simple skills reinforcement programs will not be sufficient to set up your people to be successful in operations, safety of the public and occupational health and safety requirements within an agency.

Return to Work

So how can you utilise and reinforce the knowledge and skill you recently acquired when you return to work. Is this the role of the individual or the organisation? Obviously there is a role for both. We would like to touch on some consideration for those returning to work after attending an intensive course or arriving at work after finally completing a six year part-time study.

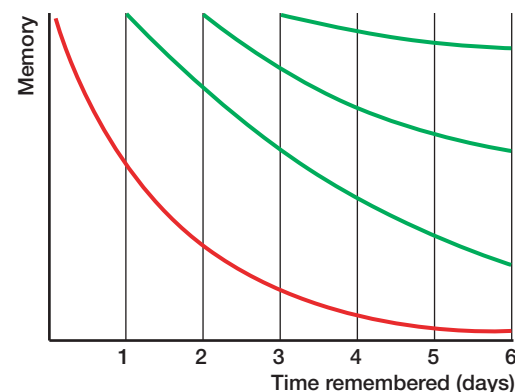
First of all, your colleagues did not attend the course and no matter how much you talk about it the pressures of the office will prevail and your decay starts immediately; your own work requirements that have been building up while you have been away are now intruding into the new knowledge you acquired. As soon as you return, talk to your line manager about how you can use the acquired skills. Be proactive and volunteer to use your new skill whenever possible.

You are not alone, as all the people that attended the course with you will be going through the same issues. Form a professional group designed to maintain your skills. The benefits of reinforcement and support are well worth the effort.

Being aware of the fact that you will suffer knowledge/skill decay is the main part of the battle, choose what is important to you, assess the skill re-use you get in your normal work life and concentrate on those important skills you wish to retain but do not utilise day to day.

Then there is the organisation's responsibility to ensure your skills are maintained. From the factors above, it is clear that if you try a one-size-fits-all approach you will not be successful in all cases; like any learning experience you should utilise a variety of reinforcement methods based on the actual skill decay. Experiential learning, relevance of knowledge/skill and skills maintenance programs appears to be the best combination.

The Forgetting Curve



Conclusion

The greater the distance of time you are from the acquisition of a skill the greater will be the skill decay. The amount of skill decay will depend on the task, how often it is used, how it was taught and the motivation of the individual. There is a two way contract between the organisation and the individual to maintain the learnt knowledge/skills for the betterment of both. This is a complicated issue and too often not seen as part of an overall learning package. Many hours of effort go into the initial course but like a good vaccination it is a waste of time without a booster.

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Protecting High-risk Assets from Lightning Strikes



Bob Grieve

Lightning Eliminators
Australia

Lightning strikes are far more common than many people realise and, with the changes in the global climate and weather patterns, they are on the increase. The Asia Pacific region is at particular risk because, according to a joint NASA and National Space Development Agency of Japan study, approximately 70 percent of lightning occurs on land in the tropics, where the majority of thunderstorms occur.

Lightning seems to most often make the headlines when it causes the death or injury of someone tragically unfortunate enough to be the victim of a cloud-to-ground strike, or when a lightning strike triggers a bushfire or wildfire. Fortunately, deaths from lightning strikes are comparatively rare – the global figure quoted by most experts is between 40 and 50 a year – but strikes causing bushfires and wildfires are much more common in the region. For example, recently in one night South Australia experienced around 50,000 lightning strikes, the majority occurring in a three-hour period, starting more than 250 fires.

In reality, there is a limited amount that can be

done to protect individuals, other than their following prescribed safety precautions during a thunder storm, and little that can be implemented to protect the countryside from lightning strikes. However, one area where lightning protection can be effective is in the industrial sector, safeguarding high-risk, high-value or high-fire-load facilities such as: petrochemical refineries, tank farms and off-shore platforms; mining operations; utilities such as electricity switch yards, substations and generating plants; data centres, telecommunications facilities and IT centres; and transport hubs, including airports and wharfs. But how real is the challenge?



A review of petroleum storage tank fires between 1951 and 2003 found that there was an average of between 15 and 20 fires every year, with about one-third caused by lightning. Another study undertaken on behalf of a number of oil industry companies found that: "lightning is the most common source of ignition" in 52 of 55 rim seal fires studied. Significantly, this research was undertaken some years ago; the reality is that there are now more tanks than in 2003, and likely more fires.

Aside from the incidence of petrochemical storage tank fires, another factor that needs to be considered is the impact of a fire. It is the age-old fire safety conundrum – an equation that considers the likelihood of a fire against the consequences if one does occur. The impact can be catastrophic. Lightning is an explosive, rapid event that releases huge amounts of energy in just a few milliseconds with an unpredictable path. A single strike of lightning releases up to 500 million volts and a temperature of around 27,000°C – three times hotter than the surface of the Sun. Such an explosion could cause millions of dollars of damage to the tank facility and the loss of the stored product.

If a strike terminates on or even near a floating roof tank for example, the current will flow in all directions and will vary in proportion to the lowest path of impedance. One unexpected arc across the roof-shell interface could ignite the fumes that are almost always present and as a consequence put that tank and an entire facility in immediate danger.

Australia's Northern Territory is one of the most lightning-prone areas on earth, but other parts of the country are increasingly experiencing lightning storms. Just two years ago, more than 173,000 lightning strikes hit South Australia's electricity network in a 24-hour period.

Elsewhere around the world lightning has resulted in airports being brought to a standstill, television and radio broadcasts going off-air, and commercial operations paralysed.

High-risk Asset Protection

There are three aspects of lightning protection that should be considered, depending on the precise nature of the asset being protected. Generally, these can be classified as: lightning protection; grounding/earthing; and surge protection.

Traditionally, lightning rods and early streamer emission (ESE) technology were used for lightning protection, but these devices have been increasingly superseded in the past couple of decades. Both lightning rods and ESEs rely on collecting a strike and, effectively, inviting it into the facility being protected, whereas the most recent technology products actually deter the strike from forming within the area being protected and so avoid the risk altogether. Grounding/earthing is critical for personal safety, sustainability and uninterrupted operations; proper grounding serves as the foundation for a complete lightning protection solution, reducing risk and optimising performance. Surge protection safeguards sensitive electronics from lightning that can easily damage or destroy sensitive electronics.



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This article focuses on lightning protection and grounding/earthing.

Charge Transfer Technology and Dissipation Array

Lightning is an electric discharge by which nature attempt to equalise the voltage between storm clouds and the earth and, in order for lightning to strike, it must connect. The difference in polarity between the bottom of the cloud and the ground is the charge differential. When this charge differential is high, the cloud begins to form downward leaders, and objects on the ground begin to form upward streamers.

When a leader then connects with a streamer, the lightning is given the path it needs to exchange the charge between the earth and the cloud. This reduces the charge differential to upward streamers, which reach up from earth-bound objects when the electrical field is strong enough. The latest technology based on Charge Transfer Technology (CTS) from USA-based Lightning Eliminators & Consultants Inc. is called the Dissipation Array System (DAS), which interrupts the formation of these upward streamers through point discharge, a phenomenon where a well-grounded point exchanges ions between the air and the ground.

Point discharge becomes more efficient when the points are connected to a low-impedance grounding system, and more ions can be transferred with a greater number of points. The DAS technology takes advantage of these principles with an optimal point configuration able to interrupt the formation of upward streamers, thereby preventing direct strikes. Working with grounding and surge suppression to achieve complete protection, a typical system includes: the Dissipation Array; a low-impedance grounding system using

chemically-charged electrodes; a Transient Voltage Surge Suppression (TVSS) to protect against transients traveling through data lines and other conductive paths; and modular strike prevention devices to supplement the Dissipation Array's area of protection.

Dissipation Arrays are available in a range of configurations for almost any structure, including: a hemisphere array for industrial or commercial structures, including poles, buildings, and towers; a parapet array for commercial or industrial flat roof buildings with a parapet around the edge; a conic array for cone-roof and dome-roof petrochemical and flammable storage tanks; and a paragon array for use on transmission and distribution lines. Other designs include arrays for flat roofed buildings, floating tank rims, smoke/exhaust stacks, and industrial and commercial structures with guy ropes. In fact, the DAS can be configured for virtually any application.

Floating Tank Protection

The latest technology for providing floating tank protection has already notched-up in excess of 5,000 instal-

lations in over 80 countries around the world. Basically, LEC's Retractable Grounding Assembly (RGA) equipment is a retractable conductor wound onto a spring-loaded reel – which is mounted directly on the tank wall or a suitably positioned mounting bracket – that is designed to electrically bond the floating roof and shell on floating roof storage tanks.

This provides the lowest impedance connection between the roof and the shell of a floating roof tank, particularly when the roof is high, by creating the shortest possible path between the two. The connection is maintained by keeping constant tension on the wide tinned-copper-braided cable so it is, unlike conventional fixed-length bypass conductors, always as short as possible regardless of the position of the floating roof.

Significantly, the RGA solution requires little regular testing, inspection or maintenance other than visual inspection of all moving parts, the removal of dirt and debris, lubrication of the bearings, and the tightening of all mechanical fixings. The ATEX certified equipment is CE Ex II 2 G T4 certified, signifying its compliance with the requirements of Directive 94/9/EC involving potentially explosive atmospheres. It is also meets the requirements of the American Petroleum Institutes' API RP 545 (*Lightning Protection of Aboveground Storage Tanks for Flammable or Combustible Liquids*).

As has been shown by two recently completed projects in Australia, the system can be installed in both new-build or retro-fitted to existing tanks. Coogee Chemicals, which manufactures a range of chemicals at its plant in Kwinana Beach, north of Rockingham, and oil and gas exploration and production company, Apache Energy, which has processing facilities on Varanus Island, have both installed RGA grounding/earthing equipment. **APF**

Bob Grieve is Managing Director of Lightning Eliminators Australia

For further information, go to www.lightningprotection.com/australia



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Firefighting Foam Advancements ... Then & Now



Dave Pelton

The Solberg Company

It is often said that in order to shape the future you need to look back and understand the past. A colleague of mine recently asked: “when and what was the last great innovation in firefighting foam?” I have to admit, I had to think about the question and before I could answer he stated: “Aqueous Film Forming Foam (AFFF) in the early 1960s, at a time when vacuum tubes and black-and-white television were considered advanced technology and John F. Kennedy was the U.S. President.” This time period is considered the last significant innovation in firefighting foam – nearly some fifty years ago. So it got me thinking about the advancements in firefighting foam and where does the future of firefighting foams lie.

The first question, of course is: what is firefighting foam?

The National Fire Protection Association (NFPA) 11 – Standard for Low, Medium and High Expansion Foam defines firefighting foam as: “... an aggregate of air-filled bubbles formed from aqueous solutions which is lower in density than flammable liquids. It is used principally to form a cohesive floating blanket on flammable and combustible liquids, and prevents or extinguishes fire by excluding air and cooling the fuel. It also prevents reignition by suppressing formation of

flammable vapours. It has the property of adhering to surfaces, which provides a degree of exposure protection from adjacent fires.”

Or simpler said... foam is used for the suppression of fire. Foam extinguishes flammable liquid or combustible liquid fires in four different ways:

- Separates the flames from the fuel surface.
- Retards vapor release from the fuel surface.
- Cools the fuel surface and any surrounding metal surfaces.
- Excludes oxygen from the flammable vapours.

How is Foam Made?

Finished foam is a combination of a foam concentrate, water, and air. When these three components are brought together in the proper proportions and mixed, foam is produced. The figure opposite shows how the final foam is made through a typical proportioning device.

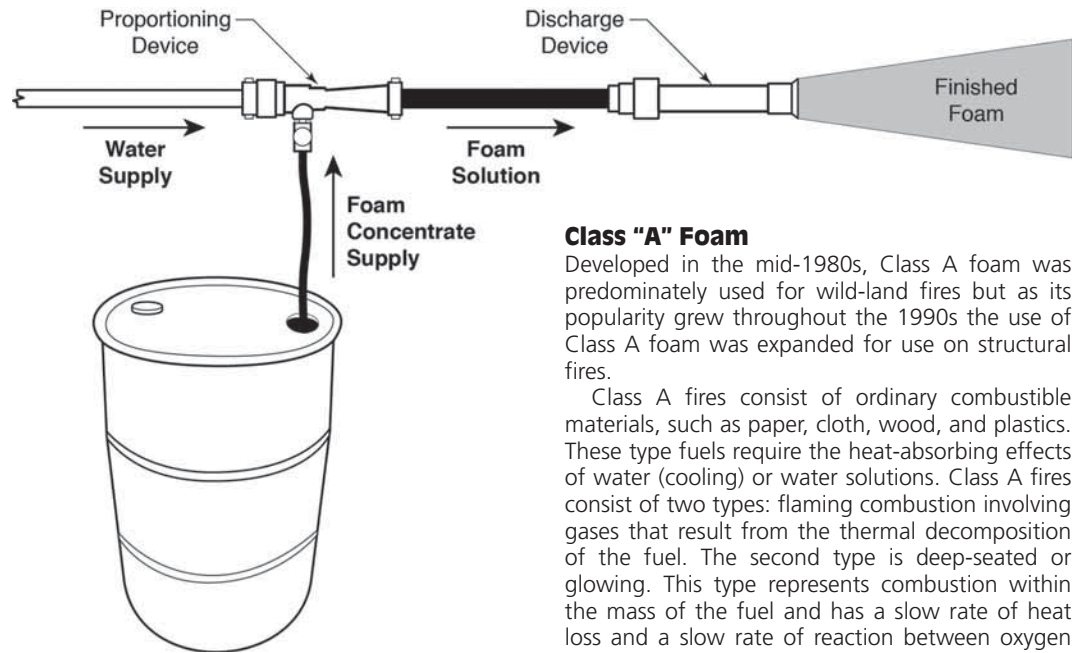
Characteristics of Foam

To be effective, good foam must contain the correct blend of physical characteristics:

- **Knockdown Speed and Flow:** This refers to the time required for the foam blanket to spread across a fuel surface or around obstacles in order to achieve complete extinguishment.
- **Heat Resistance:** Foam must be able to resist the effects of heat from any remaining fire from the liquid's flammable vapour or heated objects.
- **Fuel Resistance:** Effective foam minimises fuel pick-up so that the foam does not become saturated and burn.
- **Vapour Suppression:** A vapour-tight blanket must be capable of suppressing the flammable vapours and minimise the rise of reigniting.
- **Alcohol Resistance:** Foam blankets are more than 90 percent water. Because of this, foam blankets that are not alcohol resistant will not last very long.



FOAMS



Class "A" Foam

Developed in the mid-1980s, Class A foam was predominately used for wild-land fires but as its popularity grew throughout the 1990s the use of Class A foam was expanded for use on structural fires.

Class A fires consist of ordinary combustible materials, such as paper, cloth, wood, and plastics. These type fuels require the heat-absorbing effects of water (cooling) or water solutions. Class A fires consist of two types: flaming combustion involving gases that result from the thermal decomposition of the fuel. The second type is deep-seated or glowing. This type represents combustion within the mass of the fuel and has a slow rate of heat loss and a slow rate of reaction between oxygen and fuel.

As a synthetic based foam concentrate, Class A foam is applied at low concentrations ranging from 0.1% to 1.0% (see application rates below). Cooling and wetting are the primary extinguishing mechanisms. The use of Class A foam makes "water wetter" on average increasing the effectiveness of water tenfold.

Mop-up: 0.25% **Initial Suppression:** 0.5%

Fire Brake: 0.75% **Protection:** 1.0%

Note: the minimum admixture rate on other Class A fuel types are 0.1%.

Foam Classifications & Types

Each type of firefighting foam has its applications. Use applications range from wild-land and structural firefighting to industrial high-hazard, high-risk applications found in aviation, chemical, defense, energy, marine, mining, oil and gas, petrochemical, pharmaceutical, pipeline and solvents and coatings industries. Firefighting foams are divided into two classifications Class A and Class B.

Technicians conduct a foam burn-back test



Class B flouorochemical-free foam concentrate



These application rates make the use of Class A foam a cost effective means of combating fires because smaller amounts of foam concentrate can be used to make effective foam. Class A foam is biodegradable and non-toxic, so it is environmentally sustainable. Class A foam is deployed through a variety of portable and fixed appliance devices ranging from firefighters' backpacks, brush and fire apparatus, to rotary and fixed wing aircraft.

As we look to the future, the use of and application for Class A foam will certainly advance technologically. A current example to point to is the recent generations of nozzle-aspirated induction systems and compress air foam systems (CAFS) have been more reliable than earlier generation models.

Class "B" Foam

There are several types of available foams. Each foam concentrate is developed for a specific application. Some firefighting foams are thick and form a heavy, heat-resistant covering over a burning liquid surface. Other types of foams are thinner and because of that, they will spread much more quickly over the fuel surface. Still, other types of foams will generate a vapour sealing film on the surface of the fuel. Additional foam concentrate types, such as medium and high expansion foams, can be used in applications requiring large volumes to flood surfaces and fill cavities within the hazard.

- **Chemical Foams**

These foams are produced by the chemical reaction that occurs when the two chemicals, aluminium sulphate and sodium bicarbonate and mixed together. The energy required to create the foam bubbles comes from this reaction between the two chemicals. This type of foam is obsolete.

- **Protein Foams**

Protein foams are manufactured with naturally-occurring sources of protein, such as hoof and horn meal or feather meal. They are intended for use on hydrocarbon fuels only. Foam made from protein foam concentrates usually have good heat stability and resist burn-back. They must be properly aspirated and should not be used with non-air aspirating fog nozzles. These foams are generally not as mobile or fluid on the fuel surface as other types of low expansion foams. Protein foams are susceptible to fuel pick-up, therefore, care should be taken to minimise the foam and fuel from submerging.

- **Synthetic Foams**

This type of foam concentrate is based on a mixture of surfactants and solvents, both fluorinated and fluorosurfactant/fluoropolymer-free. These types of foam concentrates may or may not form films or membranes on the fuel surface, depending on the foam concentrate and the fuel being protected.

- **Fluoroprotein Foams**

Fluoroprotein foams are a derivative of protein foams. Fluoroprotein foams have fluorochemical surfactants added. They are intended for use on hydrocarbon fuels and selected oxygenated fuels. They must be properly aspirated and should not be used with non-air aspirating fog nozzles.

Why Use Foam?

Class B fires consist of flammable or combustible gases, and liquids. Extinguishment is normally accomplished by excluding (eliminating) oxygen, interrupting the combustion of the chain reaction, or stopping the release of the combustible vapours. The type of Class B hazards are either

FOAMS



water soluble (meaning they mix with water) [for example, polar solvents] or water insoluble (meaning they will not mix with water) [for example, hydrocarbons]. For water-soluble fuels, special alcohol resistant foam agents that will not mix with the fuel are required.

Many different extinguishing agents are effective on flammable or combustible liquids. However, foam is the only extinguishing agent capable of suppressing vapours and providing visible proof of securement. Reasons to use firefighting foam include:

- **Fire Prevention:** Application of a foam blanket on an unignited spill.
- **Vapour Suppression:** Prevention of vapours from finding an ignition source.
- **Odour Control:** Suppression of hazardous or noxious vapours.
- **Personnel Exposure:** Protection of fire and/or rescue personnel during emergency operations.
- **Asset Protection:** Pre- and post-security of the hazard until securement or removal is conducted.

Class B foam is not effective on all types of fires. It is critical to know the type of fire and fuel involved. Firefighting foam is not effective on: Class C Fires (energised electrical equipment) as

water conducts electricity and foam contains 90 percent-plus water. Class C fires can be extinguished by either de-energising the equipment or using alternative extinguishing media such as dry chemical, carbon dioxide or a clean agent; pressurised gases – materials stored as liquids but are vaporous at ambient temperature. The vapour pressure for these type fuels is too high for foam to be effective; three-dimensional fires – in which the flammable liquid is being discharged from an elevated source creating a pool fire on a lower surface area; Class D fires – combustible metals such as aluminium, magnesium, potassium, sodium and titanium alloys. The extinguishment of Class D metals requires the use of specialised dry powder agents.

Evolution of Class B Firefighting Foams

Firefighting foams have been on the market for almost 100 years in various types. Firefighting foams started with chemical foams, at each of these steps along the way, performance and safety of these various agents improved on the prior foam agent types/concentration.

Early 1900s: The first firefighting foams were chemical foams. They functioned by a chemical

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reaction from mixing two or more chemicals at the time of use, which created the foaming. More effective than water, but difficult to use and transport. Also, there was always the risk of improper mixing at the time of use.

1930s: Protein foams were a major improvement. They were chemically stable and effective on Class B fires. At that time, they quickly became the industry standard. Their major drawback was limited shelf life and limited storage temperatures, issues that are still problems for protein-based products today. Also, protein foams work best when they are discharged through air aspirating equipment that creates a thick foam blanket, but depending on the type of foam discharge equipment, can negatively affect the discharge range compared to non-aspirated equipment.

1960s: Synthetics (AFFF and AR-AFFF) entered the market. They have the ability to readily spread over a fuel surface, are very forgiving during a fire, they can be discharged through all types of nozzles, and have an extended shelf life. Fluorinated synthetic foams are the mainstay of the foam fire protection industry, and have only recently been under review, not for their firefighting performance, but due to their environmental impact. Current synthetics are capable of extinguishing hydrocarbon and water soluble fuels, and can be discharged through air aspirating and non-aspirating nozzles, allowing maximum flexibility during use.

Mid-1960s: Fluoroprotein foam was introduced after the synthetics, mainly as a market response by the protein foam manufacturers. Adding fluorosurfactant to standard protein foams allowed the protein foams to more readily spread on the fuel surface. This step improved the performance of the protein based foams to somewhere between protein only foam and the fluorinated synthetics.

2005/Present: As environmental regulations on fluorinated synthetic foam concentrates increase around the world, a new generation of environment friendly foam concentrates is being developed. These concentrates are environmentally sustainable fluorosurfactant and fluoropolymer-free firefighting foam used to effectively extinguish Class B fuels with no environmental or toxic breakdown. They are synthetic based foam technology designed to replace traditional AFFF and AR-AFFF foam concentrates and older fluoro-protein foams.

Summary

As I mentioned at the start of this article, firefighting foams have been used for the extinguishment of fire for almost 100 years in various types. Firefighting foams started with chemical foams, and at each of the advancement steps along the way, performance and safety of those agents improved on the prior foam concentrate type. Despite the importance and need for firefighting foam today, the last significant development efforts occurred in the 1960s with the commercialisation of AFFF for Class B foams, and the 1980s for Class A foam, now some fifty and twenty years ago respectively. So what

will the future hold?

Surely the developments in induction systems for Class A foam (and perhaps the agent chemistry) will continue to advance as it has over the past decade. But as for Class B foam concentrates, agent chemistry development efforts seem to have been frozen in time with reliance on existing base technologies. Only since the introduction of environmental regulations over the past five years or so on fluorine containing AFFF's have the manufacturers of firefighting foam taken the development challenge seriously. These fluorine-free products (some first generation and others second or third generation) will continue to evolve in both agent chemistry and firefighting performance with the goal of achieving high performance on flammable and combustible liquids, improved burn-back resistance for firefighter safety and provide for many additional years of shelf life over foams derived from protein.

APF

Dave Pelton is Vice President, Global Marketing for The Solberg Company

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Hydrocarbon Fire Protection for Structural Steel



Sean Appleton

3M Oil & Gas

Fire is a terrible and ever present danger for hydrocarbon processing facilities, capable of inflicting huge social, political, financial, and ecological devastation. The 2012 fire and blast at Venezuela's Amuay refinery killing 48 people and causing an estimated US\$1.7billion of damage, is just one of dozens of reported fires that occur annually at refineries around the world.

Many blame these incidents on cost-cutting and lack of preventative maintenance of safety critical systems. All involved in protecting these facilities have a duty of care to help mitigate against such disasters by reducing the potential for fire to acceptable levels.

Hydrocarbon & Jet Fire

The two most common types of fire that are likely to occur at a hydrocarbon processing facility are hydrocarbon and jet fire. Hydrocarbon or 'pool' fires occur when a flammable liquid leaks from a vessel or pipeline to form a reservoir, which then ignites. A hydrocarbon fire will generate temperatures of up to 1100°C within ten minutes of ignition and create heat fluxes of around 150-200 kW/m².

A jet fire usually involves a forceful flame, created by highly combustible fuel that is released in a particular direction as a result of a rupture to a pressurised vessel or gas line. This situation can create particularly intense levels of localised heat, plus exaggerated degrees of heat flux and turbulence, and it is far more capable of eroding fire protection measures, damaging structural steelwork and rupturing other vessels and pipework than a non-hydrocarbon blaze.

Structural Steel Protection

Petrochemical facilities often include major structural components made from steel including structural steel columns and beams, steel pipe-racks and steel supports for storage vessels containing flammable, combustible or toxic liquids.

Steel is a material often viewed as being less prone to the damaging effects of fire due to its rigidity and strength, with the ability to withstand whatever comes its way. Unfortunately this is not always the case. When exposed to temperature rises, steel can begin to lose its strength with alarming speed, particularly when under duress from hydrocarbon and jet fires. Passive fire protection measures slow the rate of heat transfer into the steel structure and significantly delay the time it takes to reach the point where structural failure occurs. This allows more precious time to evacuate personnel, activate emergency shut-down valves (ESDVs) and bring a fire under control, helping to limit the destructive effects of a major blaze.

Traditional methods for protection of structural steel elements include cementitious sprays and intumescent coatings that are applied to the surface of the steel element providing a permanent barrier. Increasingly those responsible for designing

STRUCTURAL STEEL FIRE PROTECTION

and maintaining petrochemical facilities are seeking more flexible solutions that allow ease of upgrade, maintenance, and periodic inspection for damage and degradation, including corrosion under insulation.

Corrosion under Insulation (CUI)

Corrosion under insulation (CUI) is a severe form of localised corrosion that occurs in carbon and low alloy steel equipment that has been insulated. CUI occurs when water is absorbed by the insulation and, over time, the equipment begins to corrode as it is exposed to water and oxygen. CUI is particularly common in refineries and process plants that operate equipment at high temperatures.

Research suggests that CUI is responsible for the highest incidence of leaks in refineries and chemical facilities and costs the industry tens of millions of dollars a year in repair and maintenance costs.

CUI is often difficult to detect on steel that has been fireproofed with cementitious spray or intumescent coatings because the insulation hides the corrosion problem until it is too late. Inspecting for corrosion under coated fireproof insulation usually requires cutting small sections in the coating surface and carrying out ultrasonic testing. If corrosion is ultimately discovered, the entire coating system must be removed and replaced. This whole process is expensive, time consuming and disruptive to ongoing operations. Subsequently, inspections for corrosion under insulation are not

completed regularly enough often resulting in tragic consequences.

Endothermic Technology

Flexible materials using endothermic technology release chemically bound water to slow heat transfer when exposed to high temperatures or flame and can protect structural steel components from hydrocarbon fire for up to four hours. Unlike fireproof coating systems, endothermic mats can be easily removed and re-applied for routine corrosion inspections, maintenance, or repairs.

This sheet material has a bonded aluminium foil outer layer and is both flexible and tough enough to be wrapped around a wide variety of potentially exposed vulnerable equipment. 3M Interam Endothermic Mat (or '3M E-mat'), for example, incorporates endothermic technology and has been proven to provide outstanding performance for a range of fire scenarios including large hydrocarbon pool fires in accordance with UL 1709 (ASTM E 1529).

3M E-mat wraps around structural steel elements and is held in place by stainless steel strapping, with aluminium foil tape and fireproofing sealant used to cover gaps, seams and termination points. In most circumstance, little or no preparation to the steel substrate is required. E-mat can also be applied directly over existing cement or block where upgrade in fire protection is required. 3M E-mat does not encourage corrosion and can be installed with or without a stainless steel jacket, which helps preserve the



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Case Study: US Gulf Coast Refinery

More than 15 years ago, a large oil and gas refinery on the US Gulf Coast installed 3M E-mat to protect structural steel. The material was applied to protect the vessel skirts and two-story tall steel legs that support many large spherical tanks containing flammable petroleum distillates in the refinery.

Two layers of 3M E-mat were wrapped around the approximately 61-centimetre-wide legs and held in place with stainless steel banding. Although not required, a stainless steel jacket was then applied on top of the 3M E-mat to protect the material from rain, salt in the humid air, dust, and ultraviolet light in sunlight.

An engineer at the refinery recently contacted 3M and requested assistance in identifying the 3M material. At the time, the plant was conducting a periodic inspection of the structural steel in various areas of the refinery to determine if corrosion beneath the 3M E-mat was occurring. "It only took a moment to identify the 3M Interam Endothermic Mat. The 3M product was well protected by the stainless steel jacket and looked like it was new. There was no deterioration at all," said Matthew Aguirre, Sales Representative, 3M Building & Commercial Services / Fire Protection Products. "The structural steel also looked great and showed no sign of rust or corrosion."

The non-destructive inspection and testing for corrosion and compliance was performed quickly, and the 3M E-mat that had been removed without being damaged was simply reinstalled. A few damaged pieces that occurred during inspection needed to be replaced. "Refinery officials were very pleased with the inspection results and they were surprised by the longevity of 3M E-mat," said Aguirre. "The material does not dry out so maintenance is effortless. It also allows easy inspection. Just cut a piece to inspect the structural steel, then foil tape it back into place and add the stainless steel band. It's that easy."

system in extremely harsh conditions. The material satisfies UL 1709 environmental test standards both with and without the stainless steel jacketing.

Conclusion

CUI is a common problem shared by hydrocarbon and gas processing facilities around the world. CUI is difficult to detect because it is often hidden by a fireproof coating that masks the corrosion problem until it is too late. Flexible and re-enterable endothermic wrap systems such as 3M E-mat offer many functional and economic benefits to asset owners.

3M E-Mat has been used extensively around the world for over 30 years and is ideal for effective fire safety solutions for both offshore and onshore energy environments. **APF**

Sean Appleton is Marketing Manager at 3M Oil & Gas

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New Technology

UL-Listed Total Flooding System Sets New Standard



Scott Starr

Firetrace International

The launch of a new engineered clean agent total room flooding system that has just received UL Listing means that total room flooding installations no longer have to be more complicated than necessary. Installation costs can now be drastically reduced, previously unattainable design flexibility is also a reality; and installation times have been slashed.

The new engineered clean agent total room flooding system from Firetrace International achieves much of its success by optimising the “industry standard” flow calculation method in order to exploit the superior flow characteristics of 3M Novec 1230 Fire Protection Fluid.

It delivers a host of substantial and measurable performance enhancements when compared with traditional delivery systems. These include superior performance, greater flexibility, improved value, speedier installation and a measurable competitive edge for system installers. Compared with traditional clean agent total flooding systems, the new E⁴ system from Firetrace International requires between 25 percent and 40 percent less piping; delivers a 300-plus percent increase in the horizontal cylinder-to-nozzle distance; the vertical distance is increased by more than 400 percent; and there is a 700-plus percent increase in liquid agent to pipe volumes. The result is the largest possible networks without the need for extra equipment, and lower hardware cost for every

square meter of area protected.

The new UL Listed engineered clean agent total flooding system takes full advantage of the unique characteristics of Novec 1230 fire suppressing agent. Novec 1230 is a next generation Halon alternative that provides outstanding performance, a large margin of safety for occupied spaces and an excellent environmental profile. It is the first Halon replacement to offer a long term, sustainable technology for special hazards fire protection.

The E⁴ total flooding systems utilise the latest 34.5 bar total flooding technology that provides impressive performance gains compared with traditional total flooding systems, many of which use conventions developed for Halon systems in the 1980s; conventions that were continued by many HFC and Novec total flooding systems.

Systems are available in eight capacities with fill volumes ranging from 4 kg to 590 kg – the largest cylinder in the industry (the UL Listing applies across the entire range of charging capacities). They offer higher agent fill density (more agent in

TOTAL FLOODING SUPPRESSION



Clean Agent Selection

The risk of fire is very real in data centres or IT facilities; faulty electrical connections, short circuits, thermal overload and power line surges are just a few of the many causes of fires. Quick detection and suppression of a fire is critical for reducing or eliminating downtime. However, it is also critical that the fire suppressing agent has no adverse effect on data centre operations. Firetrace's new total flooding systems use "clean" fire suppressing agents such as Novec 1230. The term "clean agent" is commonly used because these agents leave behind no residue and cause no collateral damage. Clean agents such as Novec 1230 are electrically non-conductive, non-corrosive and can safely be discharged on energised equipment located in occupied areas.

the same size space) and are capable of massive piping volume capabilities without the need for expensive N2 drivers and are available with stackable actuator systems, so the remote storage of cylinders is no longer a challenge.

All cylinders can be under-filled in one kilogram increments to meet the exact amount of Novec 1230 required. Nozzles are available in centre and side discharge patterns for pipe sizes ranging from

12.5 mm to 64 mm. The systems can be activated either manually or automatically using mechanical, pneumatic or electrical activation.

The number of tees and nozzles is greatly reduced and the challenge of having to accurately equally balance the amount of agent at Bull T and Side T connections, plus extra pipe lengths between tees are either minimal or completely unnecessary. With E⁴, the Bull T split can be up to a 90/10 split, while the Side T can be up to 50/50 and 93/74 split. The result is an installation that can show more than a 50 percent saving on

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TOTAL FLOODING SUPPRESSION



labour costs through "smart" pipe layouts that are impossible to achieve with the design limitations inherent in old-technology systems.

System installers' end-user customers also benefit, achieving a much lower financial outlay when compared with other systems on the market, and greatly improved design freedom. For example, with conventional systems the maximum possible cylinder-to-nozzle distance is frequently little more than 20 meters to 25 meters. This often means that cylinders have to be located in the room being protected. However, with E⁴ the distance

Case Study

Government Centre Protected by New UL Listed System

Recognising the need for effective protection against the risk of fire, the USA's Social Security Administration's (SSA) new 27,871 square meter National Support Centre in Maryland is protected using Firetrace International's new advanced UL Listed E⁴ engineered clean agent total flooding system. Utilising more than 40,820 kg of 3M Novec 1230 Fire Protection Fluid, the system easily rates as one of the largest "clean agent" total flooding systems ever installed.

A total of 128 Firetrace E⁴ clean agent cylinders have been installed, each of which is capable of holding up to 590 kg of Novec 1230 Fire Protection Fluid. The cylinders are deployed in 24 banks that are protecting 12 separate zones throughout the Centre.

The Social Security Administration oversees 460 million records of earnings and benefits for 57 million social security beneficiaries and 160 million workers. According to SSA, an hour's shutdown would cause serious repercussions; an extended system outage would have national implications.

benefits associated with inert gas systems are now achievable with Novec 1230.

It is now possible to protect an entire facility from a single bank of E⁴ cylinders. In fact, by merely replacing the cylinders and nozzles, E⁴ provides a swift, least-cost transition from most existing Halon systems to Novec 1230 clean agent technology.

Firetrace's E⁴ complies fully with every aspect of NFPA 2001: 2012 (*Standard on Clean Agent Fire Extinguishing Systems*) and the European standard BS EN 15004:2008 (*Fixed firefighting systems. Gas extinguishing systems. Design, installation and maintenance*). The system's cylinders are also UL Listed and are manufactured, tested and stamped in accordance with DOT 4BW500 or DOT 4BA500. E⁴ systems are manufactured in an AS9100C/ISO 9001:2008-certified facility. They are compatible with most popular releasing panels. Firetrace also offers DuPont FM-200 total flooding systems. **APF**

Scott Starr is Director of Marketing at Firetrace International

For further information, go to www.firetrace.com

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Oxygen Reduction

Oxygen reduction fire prevention installation, Sydney Adventist Hospital, Australia



Martin McGettrick

ARA Group



Oxygen-reduction fire prevention is a revolution in fire safety, and the world's latest technological innovation in fire prevention. It has the unique ability to create an environment of breathable, controlled oxygen-reduced air that prevents fire ignition. Oxygen-reduction systems prevent fire proactively instead of suppressing a fire after it has started and damage and business interruption has occurred.

Oxygen-reduction fire prevention uses a technology that produces oxygen-reduced (hypoxic) air by partly filtering out oxygen from ambient atmospheric air. Normal atmosphere contains 21 percent oxygen. The hypoxic air injected into a protected space is 15 percent oxygen and 84 percent nitrogen (1 percent is made up of argon, carbon dioxide and other gases). A fire cannot start in this environment. Common flammable solid materials and liquids cannot be ignited with an oxygen level below 16 percent.

Safe for People and Safe for the Environment

Oxygen-reduction fire prevention uses ambient air to produce breathable air for fire prevention. It is safe for people and safe for the environment – no chemicals or gases are involved. The oxygen-reduction fire prevention agent is simply oxygen-reduced (hypoxic) air.

Hypoxic environments created for the purpose of fire prevention are precisely controlled and monitored reduced-oxygen environments. They should not be confused with other environments where hypoxic conditions can occur in an uncontrolled, unwanted or unexpected way. Oxygen-reduction fire prevention systems are clean-air systems. There has been extensive medical research in the UK, Europe and Australia to support the safety of working in a hypoxic environment of oxygen at 16 percent and below.

At sea level, 15 percent oxygen content is equivalent, in terms of human physiology, to normal atmospheric air at an elevation of around

2,700 metres above sea level or being on a commercial flight. Millions of people around the world live at altitudes equivalent to exposure at or below 15 percent oxygen concentration at sea level. Hypoxic air environments are currently used for physical training and rehabilitation of athletes, as well as in medical research.

What are the Suitable Environments?

Oxygen-reduction fire prevention is best suited to any situation that requires the highest levels of fire prevention, and where uninterrupted operation is essential including high-value technical installations such as data centres, server rooms, and electrical switch rooms.

Hypoxic air has no detrimental effect on equipment. The oxygen-reduced environment slows oxidation and is perfect for preservation of irreplaceable items such as archived documents, museum exhibits, artworks and rare artefacts.

Typically, applications include: data centres; server rooms; electrical switch rooms; power correction rooms; control rooms in power plants; telecommunication rooms; laboratories; libraries; museums; archive rooms; warehouses; hazardous materials storage; food storage areas; deep freeze environments; and cold storage rooms.

How does the System Control Oxygen Monitoring?

The system is designed to enable the oxygen concentration levels to be monitored on a continual basis by a minimum of two independent oxygen sensors, in different locations, in each protected

Fire Prevention

space. The monitoring units are typically placed at eye level, at an appropriate distance from the door of the room. This is to provide for monitoring of oxygen conditions and alert if doors are wedged open or not closed properly, while minimising the amount of false, high oxygen alarms. The oxygen sensors transmit to monitoring and control points (for example, the fire alarm panel and the building management system), as required.

Performance indicators show, as a minimum, for each protected space:

- Oxygen concentration level as indicated by every oxygen sensor.
- High and low oxygen alarm conditions.
- An output indicating the operation of any other system alarms.

Health & Safety

The design aim of any oxygen-reduction fire prevention system is to create and maintain an atmosphere in an enclosure that is capable of preventing ignition of combustibles found within the protected area while simultaneously remaining safe for the occupants.

A risk assessment, in accordance with AS/NZS ISO 31000-2009, *Risk management – Principles and guidelines*, should be carried out prior to any installation of an oxygen-reduction fire prevention system to ensure safety of both people within the protected area and those outside the protected area that may be exposed to output air from the oxygen-reduction fire prevention system.

Such an assessment shall detail:

- 1 The safeguards employed for people having access to the protected space and oxygen-reduction fire prevention system equipment.
- 2 Limitations to the number of people allowed in the protected enclosure and the level and duration of physical activity permitted to be undertaken.

Installation

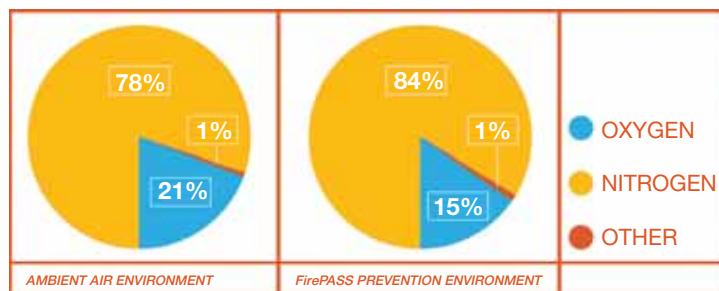
Oxygen-reduction fire prevention systems come readily mounted and tested. Once on site, the system is connected to the room sensors and to the power supply. The system is then connected to the rooms via the installed tubing. The by-product oxygen-enriched air is vented outside.

Oxygen-reduction fire prevention systems have a smaller footprint compared with conventional gaseous suppression systems and do not require rigid piping within the protected spaces. The only requirement is simple; minimal pressure piping to each protected area and to the ambient air, along with wiring of the oxygen monitoring units in the protected areas.

It is recommended that protected areas be equipped with highly sensitive smoke detectors such as very early smoke detection apparatus (VESDA) or equivalent. This is to ensure that any

smouldering combustion from cable faults, for example, is reported in its incipient stages.

A comfortable, breathable atmosphere is created inside the protected space by the ongoing ventilation with fresh, hypoxic air. The highly reliable hypoxic air generators require very little maintenance – a maintenance cycle of six months is typical. Regular monthly inspections are recommended to ensure a fire preventative atmosphere is maintained.



Ambient air environment compared to oxygen-reduced environment

Oslo Museum of Cultural History, University of Oslo, Norway

The Museum of Cultural History is one of Norway's largest cultural history museums. It holds the country's largest prehistoric and medieval archaeological collections, including the Viking ships at Bygdøy, Norway. The museum also has a comprehensive ethnographic (study of people and their cultures) collection that includes objects from every continent, as well as Norway's largest collection of historical coins. An oxygen-reduction fire prevention system is protecting six areas of approximately, 14,000 cubic metres.

Ministry of Defence Pension Fund, Muscat, Oman

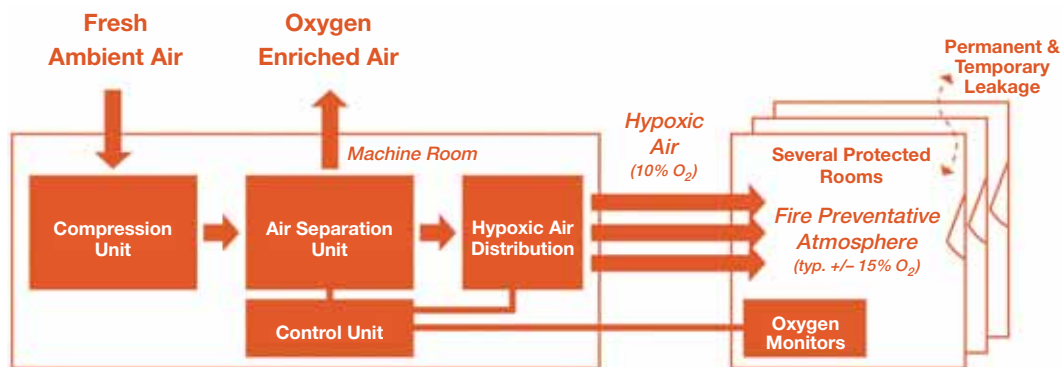
Muscat is the capital of Oman. The city lies on the Arabian Sea, along the Gulf of Oman. It is one of the Middle East's oldest cities. An oxygen-reduction fire prevention system is protecting nine areas in the Muscat Data Centre.

Sydney Adventist Hospital, Sydney, Australia

Sydney Adventist Hospital (SAH) is NSW's largest single campus private hospital, a multi-award winning facility offering access to world-class doctors, nurses and other health professionals. With approximately 2,300 staff, 500 volunteers and 750 accredited medical practitioners, SAH offers comprehensive surgical, medical, and emergency services to more than 53,000 inpatients and 180,000 outpatients each year.

An oxygen-reduction fire prevention system is protecting several rooms at the SAH, including the power factor correction room and the hospital's main switch room that feeds the operating theatres; a volume of approximately 500 cubic metres.

System Configuration



Oxygen-reduction fire prevention systems can be implemented as an alternative, but also as a complementary or supplementary option that enhances the conventional fire-safety means without interfering with their performance.

Sealing the Rooms

It is essential the protected area is well sealed in order to minimise the permanent leakage of air in and out of the room. The key factor relating to running costs (energy consumption and maintenance) of an oxygen-reduction fire prevention installation is the leakage. This is the sum of permanent leakage of the protected area and the temporary leakage created by door openings. Investing in improving the sealing of the protected areas will have a direct impact on running costs, as they are directly proportional to the leakage rate achieved. Typically, the payback for such improvements is less than one year. All spaces in the protected area must have split-type air cooling or closed, dedicated air recirculation systems.

To evaluate the current leakage of the area to be protected, it is recommended to perform an integrity fan test (accurately predicts the room's pressurisation and identifies any leaks in the room), prior to any works being commenced.

Venting/Cooling

The area where the compressors and filtration units are housed is required to be well-vented in order to allow a permanent supply of fresh, ambient air to the compressors. Alternatively, the room can be cooled with chillers; this will also require a supply of fresh air. There is a requirement for a small drain in the machine room for the wastewater of the condensate cleaner.

Maintenance

The oxygen-reduction fire prevention generators are highly reliable passive units that can operate for decades with proper maintenance. This normally includes, as a minimum, changing the filters after every 3,000 operating hours or at latest after 12 months. This cycle applies if the supplied fresh air is compliant with the required quality. If the air quality is lower (in the event of dust, humidity, temperature etc.) the cycle of filter changes needs to be reduced. The compressors require regular maintenance with a cycle of 2,000 running hours.

Inspections

• Acceptance test

The operator/operating company must subject the oxygen-reduction fire prevention system to an acceptance test by a qualified person after

installation or after any significant modification to the system. This test must take place prior to commissioning.

• Regular Inspections

The operators /operating companies must have the proper function of the oxygen-reduction fire prevention systems tested by a qualified person at least once per year. Special operational circumstances may make it necessary to carry out more frequent inspections.

• Record of Inspections

The results of the inspections must be recorded in an inspection report. The records of the acceptance tests must be kept throughout the operating time of the oxygen-reduction fire prevention system. The records of the regular inspections must be kept for at least four years. These may be stored on computer data carriers. The documents must be presented to the competent supervisory authorities upon request.

Limitations on Installation

Oxygen-reduction fire prevention systems should not be installed for use in areas where:

- Sufficient infiltration control cannot be achieved.
- An alternative source of oxygen is present.
- Oxidizing agents exist that have the potential to reduce oxygen concentration by chemical reaction (for example, chlorine).
- Substances or processes exist that evolve gases capable of modifying the atmosphere such that the oxygen concentration is reduced (for example, toxic displacement).

Benefits of Oxygen-Reduction Fire Prevention

- Certainty of avoiding the outbreak and spread of fire.
- Continuous fire prevention without any interruption; no refilling or replacement required.
- Straightforward installation process compared with a sprinkler system or a traditional fire suppression system.
- Very small footprint and little building space required.
- Environmentally friendly – no chemicals used.
- Simple to install and maintain.
- Easily installed into existing premises as well as newly built spaces.
- Retaining access to protected areas at any time.
- Scalable to fit any sized area, large or small.
- Slows oxidation and reduces deterioration of materials, equipment, documents and artefacts.

Oxygen-reduction fire prevention systems provide unmatched fire safety and achieve the ultimate goal in fire protection – fire prevention.

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INDIA**FOREMOST MARKETING PVT LTD**

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Tel: +91 11 261 969 82 Fax: +91 11 261 669 61
Email: foremosttechnico@gmail.com
Website: www.foremostsafety.com
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INDONESIA**PT INSPIRAN IDEAL INDOTAMA**

Jl. Pejaten Barat No. 39, Pasar Minggu
Jakarta Selatan 12510 Indonesia
Contact: Lim Tiam Hwat
Tel: 62-21-7182472
Mobile: 62-816889164
Fax: 62-21-7182578
Email: lim@inspiran.co.id
Website: www.inspiran.co.id
Dealer/Distributor

JAPAN**ABLE-YAMAUCHI CO LTD**

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10-36 Kitasaiwai, 2-Chome Nishi-Ku
Yokohama 220-0004, Japan
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Email: emiko@able-yamauchi.co.jp
Website: www.able.yamauchi.co.jp
Dealer/Distributor

MALAYSIA**DASAPREM (M) SDN BHD**

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40000 Shah Alam
Selangor Darul Ehsan, Malaysia
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Tel: +603 550 9060 Fax: +603 550 4486
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Website: www.dasaprem.com
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NEW ZEALAND**PHILLIPS & SMITH LTD**

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Email: stuart@firemaster.co.nz
Website: www.firemaster.co.nz
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PHILIPPINES**24 HR RESOURCES CORPORATION**

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SINGAPORE**YEN LEE FIREWELD PTE LTD**

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Website: www.fireweld.com.sg
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SRI LANKA**FIRETECH (PRIVATE) LTD**

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TAIWAN**SHENG-TAI FIRE PROTECTION INDUSTRIAL CO LTD**

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Dealer/Distributor

VIETNAM**TRAN VU TRADING CO LTD**

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SHIMADA & CO LTD

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Fax: 81-6-6575-3545
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KOREA SOUTH

DONGJIN ENGINEERING CO LTD

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Website: www.rainbowrunner.net

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COLTRI COMPRESSORS MALDIVES

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AIR TECHNOLOGY LTD

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Fax: 64-9-478 6221
Website: www.divecompressors.co.nz

Dealer/Distributor

PHILIPPINES

DIVE SUPPLY SUBIC, INC.

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Subic Freeport Zone
2222 Olongapo

Dealer/Distributor

AQUAVENTURE WHITETIP DIVE SUPPLY – BORACAY

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Website: www.aquaventurewhitetip.com

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Website: www.aquaventurewhitetip.com

Dealer/Distributor

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Website: www.aquaventurewhitetip.com

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SHANGHAI PANNY TRADING CO LTD

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sdesystems@csloxinfo.com
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COLTRI COMPRESSOR VIETNAM

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BIG RED TRUCK FIRE AND RESCUE SUPPLIES

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Website: www.bigredtruck.com.au

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CHINA

ANCOM SYSTEMS INC

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Middle Road
North 3rd Ring Road
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Fax: 86 10 6207 7929
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Website: www.ancom.cn

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Qian Yao Road, Wuxi
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Prc 214151
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Fax: 86 510 8275 4257
Email: mail@wfs.com
Website: www.wfs.com

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TIAN YOU INTERNATIONAL DEV CO

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11-19 Sha Tsuo Road
Tsuen Wan
Hong Kong
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Email: info@tianyou.com.hk

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ASKA EQUIPMENTS LTD

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Sushil Muni Square
Shankar Road
New Delhi PIN – 110 060
India
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Email: info@askagroup.com
Website: www.askagroup.com

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PT MITRA TEKNIKATAMA SUPPLINDO

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Jakarta Utara 14440
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JAPAN**TEIKOKU SEN-I CO LTD**

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Chuo-Ku
Tokyo 103
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Email: ohno@teisen.co.jp
Website: www.teisen.co.jp
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MALAYASIA**CITO MARKETING SDN BHD**

No 11
Jalan SS15/4B Subang Jaya
47500 Petaling Jaya
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Darul Ehsan 47500
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Tel: 60 37311286 Fax: 60 37340583
Email: cito@po.jaring.my
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SJA TRADE & SERVICES SDN BHD

Kelana Center
Suite 72, Blk 1
Jalan SS 7/19 Kelana Jaya
Selangor
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Contact: Hetty Zurin Hamdan
Tel: 60 37847400 Fax: 60 37848500
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Negros Occidental 6100
Telefax: +63 34 7091549
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Dealer/Distributor

SOUTH KOREA**JINUTEC INTERNATIONAL DIVISION**

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Tel: 82 31 3758558 Fax: 82 31 3754884
Email: hyna@jinutec.com
Website: www.jinutec.com
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PO Box 46-482, Taipei
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Email: allstron@ms19.hinet.net
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PACIFIC CENTURY INDUSTRIAL CO LTD

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6F-7 No. 21, Sec 3
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Shankar Road, New Delhi – 110 060 India
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(All India Sales)
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Fax: 011 27014413
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Website: www.askagroup.com
Dealer/Distributor

KOREA**NINE TECO CO LTD**

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Website: www.ninewinch.com
Dealer/Distributor

SINGAPORE**TETRA FIRE ENGINEERING PTE LTD**

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Ubi Techpark, Singapore 408564
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Email: tetra@singnet.com.sg
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Taoyuan County 320
Taiwan (R.O.C.)
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Fax: 886-3-4632376
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**AUSTRALIA****FIRE PROTECTION TECHNOLOGIES PTY LTD**

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BANGLADESH**MARS SYNDICATE**

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INDIA**NEWAGE FIRE PROTECTION ENGINEERS**

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PAKISTAN**MGH ENGINEERING AND CONTROL PVT LTD**

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FIRE FIGHTING ENTERPRISES

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ASIA PACIFIC FIRE MAGAZINE

REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY



Issue 51 • September 2014
www.mdmpublishing.com

G-Force Nozzles: The Inside Story

Based on a highly customizable global nozzle platform design, the unique G-Force series of fixed, selectable, and automatic nozzles combine over 40 years of Task Force Tips design innovation and experience into true next generation firefighting tools. Manufactured exclusively at TFT's USA production facilities, the G-Force series is supported by an extensive infrastructure of 24-hour technical service representatives, on-line documentation, digital video training library, exclusive product serialization and tracking capabilities, and a proven 5 year product warranty. Incorporating unique performance components such as a stainless steel slide valve, inlet debris screen and protective fog pattern choices, the G-Force series delivers high performance and rugged dependability.

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Choice of:

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in harsh conditions

Lightweight Hard Anodized
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pressure or flush selections
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G-Force



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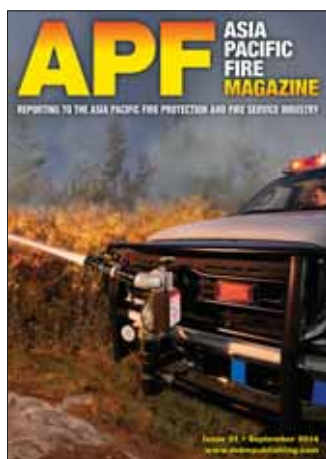
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See CHECKFIRE in action at
www.ansul.com/CHECKFIRE210video

October 2014 Issue 51



The remotely controlled Tornado monitor from Task Force Tips lets the firefighting crew manage initial attack firefighting operations from the safety of the fire apparatus cab. The Tornado integrates a hand-held joystick monitor, valve and nozzle controller with TFT's exclusive water saving Smart Stream Technology. To learn more about providing maximum performance and safety to limited staff during wildfire operations, visit www.tft.com

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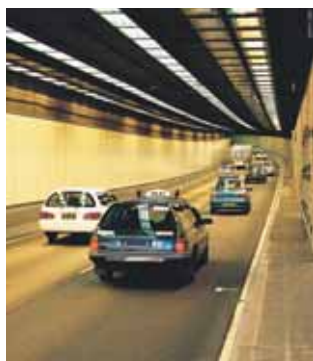
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Graham Collins

Email: graham.collins@mdmpublishing.com

Be Prepared

When I was a student I had to write a paper on Risk and Uncertainty. When undertaking my research I formed a conclusion that of the two challenges uncertainty was, for me at least, the more confronting and daunting. While risks can be many and various, it is usually possible to devise a response and plan of action. However, uncertainty, by definition, means that it may happen; on the other hand, it may not.

When it comes to firefighting and rescue operations, uncertainty comes in all sorts of guises. What might happen; when might it happen; where will it happen; what might cause it to happen; what are the implications if it happens today, right now, are questions that immediately spring to mind.

Who among us expected the catalogue of natural disasters that befell the Asia Pacific region in just the first ten days of this August? A 6.1 magnitude earthquake in Ludian County, Yunnan in southern China has, at the time of writing this editorial, a death toll of more than 600; over 12,000 houses have collapsed and 30,000 have been damaged. Three days later a massive landslide in the Barhabise area of the Sindhupalchowk region of Nepal killed 156 people. The following

training those that could possibly be affected is just as important so they know what to do and when to do it. Resources too have to be in place and, as we are dealing with uncertainty, these resources need to be mobile – available for deployment in swift order wherever they are needed.

A considerable amount of this training work does, of course, already go on, particular of those at the sharp-end of natural disaster response. In some cases, considerable efforts have also gone into ensuring that there is a quick response to such emergencies. I suspect the weak link in the chain though might be the depth of “big picture” planning that goes on at the policy and strategic levels. Politics, as it so often does, also comes into play, particularly when juggling with the allocation of funds.

Natural disasters are getting more frequent, more severe and more costly. There is an old military adage that goes: “Time spent in reconnaissance is seldom wasted”. Paraphrase this to: “Time spent in planning is seldom wasted,” and you have about got it right.

day flooding in southern Kandal province in Cambodia claimed the lives of eight people and more than 4,000 families had to be evacuated from their submerged homes. Elsewhere, the death toll mounted as a result of typhoons in South Korea and southwest Japan, and heavy rainfall and flooding in several parts of India.

Sure, history alone teaches us (or should teach us) that there is a risk of these events happening in our part of the world. However, what history does not tell us is the uncertain bit – when the next event is due or how ferocious it will be. So, the only sensible option, as any Boy Scout will tell you, is: Be Prepared.

But what is being prepared for the unexpected? In reality, it is a host of things. Training is obviously key to achieving the best possible outcome. But not solely training the professional emergency services personnel, vitally important though that is;

The reality though is that natural disasters are getting more frequent, more severe and more costly to the public purse. And there is an old military adage attributed to the ancient Chinese general, Sun Tzu that goes: “Time spent in reconnaissance is seldom wasted”. Paraphrase this to: “Time spent in *planning* is seldom wasted,” and I think you have about got it right.

Uncertainty is always going to be with us, but the more we are prepared to anticipate the unexpected, and have tried and tested plans in place to deal with whatever comes along, the fewer the number of lives likely to be lost. And when we are thinking the unthinkable, we may also even come up with solutions that themselves either reduce the likelihood of the disaster taking place or reduce the resources that have to be committed in its aftermath. It is all about being prepared. APF



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Matt Klaus

NFPA Fire Protection
Research Foundation

Suppression Systems for Industrial Occupancies

When NFPA 13 is not Enough

Designing suppression systems for most new projects and facilities is often as simple as turning to NFPA 13 (Installation of Sprinkler Systems) that in most cases provides all the design guidance you will need. When dealing with industrial facilities however, NFPA 13 may be only one of several NFPA codes and standards that you need to review before understanding the entire scope of the required suppression scheme.

Most facilities, including office buildings, retail outlets and restaurants, are required to have NFPA 13-compliant automatic sprinkler systems, as required by the applicable building code or life safety code in that jurisdiction. Industrial facilities often have additional occupancy, storage, or process standards that address unique hazards in these facilities; hazards that may require alternative suppression systems, risk assessments, or modifications to the base-line requirements of NFPA 13. Standards like NFPA 36 (Solvent Extraction Plants) and NFPA 86, (Ovens and Furnaces) while not as well-known as standards like NFPA 13, are critically important to designing the fire protection program for the unique fire protection challenges presented in these facilities.

In addition to, or in some cases in lieu of, a traditional closed head, wet pipe sprinkler system, many of these industrial applications require the use of other suppression standards, such as NFPA 15 (Water Spray Fixed Systems for Fire Protection) NFPA 16 (Installation of Foam-Water Sprinkler and Foam-Water Spray Systems) or NFPA 2001 (Clean Agent Fire Extinguishing Systems). In other instances, these occupancy and process standards may require a traditional sprinkler system, but with specific design discharge criteria or spacing requirements that differ from NFPA 13.

If you are familiar only with NFPA 13, there are two starting points to find the required system requirements for special industrial occupancies. First, NFPA 13 has included extracted information in Chapter 22 from dozens of industrial standards.

This chapter contains the suppression-related requirements for many industrial facilities, including liquid propane gas plants, semi-conductor production facilities, and hydroelectric generating plants. This chapter is intended to highlight possible special design requirements for these types of facilities, requirements that are unique and supersede those of NFPA 13.

In addition, you can use NFPA's list of codes and standards at www.nfpa.org to determine if a specific standard exists. All NFPA standards are available free through the NFPA doc info pages and the "real read" feature. Subscribers to the National Fire Code Subscription Service (NFCSS) can search nearly 300 documents for keywords to determine if special suppression requirements exist and which standards should be used for the design of those systems.

Simply going to NFPA 13 and expecting to find every answer to every suppression question for industrial facilities can be a costly mistake. It is not uncommon for system designers and owners to be unaware of all of the special features and design requirements that go into these facilities until it is too late. This can lead to delayed openings, costly change orders, and possibly abatement orders or shutdowns from the authority having jurisdiction if these "design deficiencies" are found after the facility is open. Do not let this happen to your project. Make sure you have a complete understanding of the hazards and system requirements for your industrial occupancy, and use the tools at your disposal to make sure your research is comprehensive and complete.

APF

Matt Klaus is Principal Fire Protection Engineer, at the NFPA

For further information, go to www.nfpa.com

Large Flow Fan

To prevent the flames and smoke spreading in large structures, such as parking garages, airports, aircraft on the ground, subways and rail and road tunnels, LEADER has produced the Easy 4000 large flow ventilation unit, which enables 3000 square metres to be blown in just 30 seconds. Also, during the smoke extraction in a one-kilometre, double-track tunnel, smoke was cleared in 12 minutes bringing sufficient visibility to enable firefighters to enter. The tunnel was completely cleared within 20 minutes. The Easy 4000 can also help to rapidly reduce the concentration of CO and, in the right conditions, allow operations to continue without the need for SCBA.

The Easy 4000 has a four-stroke BMW



Flat Twin engine with an electronic start-up that gives a powerful airflow of 400,000 cubic-metres-an-hour in the open air. The extremely low weight of the Easy 4000 gives them what Leader describes

as: "an unrivalled performance/manoeuvrability ratio in operation, meaning just one or two firefighters can handle them easily." Equipped with a nozzle spraying system in the standard version, Leader large flow fans offer effective gas dilution, dissipation or displacement and smoke cooling.

In addition to the light-weight trailer version, the fans are available in a skid version for attachment to an operational vehicle, truck or trailer. Other options are also available such as 360 degree manual rotation system, 600 mm or 1200 mm elevating platforms, flexible exhaust gas extensions, and blowing ducts.

For more information, go to www.leader-group.eu

UL-Listing for Liquid Level Indicator

PORTALEVEL has announced that its MAX portable liquid level indicator has received UL Listing. It is available in two model types: Portalevel MAX and Portalevel MAX Marine (for shipboard use to enable SOLAS compliance) and designed for easy liquid level indication for CO₂, FM-200, Novec 1230, FE-13, FE-25 and FE-36 HFC-225 and 227 and Halon 1301.

For more information, go to www.portalevel-max.com

New Special Ops Power Blower



Following the introduction of the SP Power Blower and its laminar air flow (LAF), TEMPEST has released a GFCI compatible, electric platform version of the fan called the SP VS.

The SP VS bears the same design as its gasoline driven predecessor. The difference comes in the power; torqued by a large 2.0 hp electric motor and controlled by Tempest's latest VS (Variable Speed) drive. The drive is both GFCI compatible and NEMA 4 rated. Only two controls are needed to operate the unit, an on/off switch and a

rheostat knob. This ensures the unit can be deployed quickly and operated safely by just about anyone.

For more information, go to www.tempest.us.com

Online Fire & Electrical Training



NEXT KNOWLEDGE, a division of Hughes Associates, has announced that its self-paced fire and electrical safety training is now available to the fire protection industry through a new online learning centre. It comprises over 100 hours of training devoted exclusively to fire protection and electrical safety topics.

The training is delivered in a straight-forward, interactive format. The courses are written by noted experts in fire protection codes and standards, who also have extensive hands-on experience. The result is high-impact courses designed for professional engineers and technicians who require training on demand, delivered in a straightforward but engaging presentation.

For more information, go to www.nextknowledge.com

Moisture Barrier's Role in Firefighter Protection

One of the most significant advances in firefighter protection of the past 25 years has been the introduction of a durable, waterproof, breathable moisture barrier into protective clothing.

W.L. Gore & Associates Inc was first to create the concept of keeping emergency responders dry and comfortable on the frontline with the introduction of its renowned GORE-TEX® Fabric in the late 80s. This was followed by the arrival of CROSSTECH® fabric a few years later, which adds protection from blood-borne pathogens and common chemicals to the core functions of breathability and waterproofness.

Gore Fabrics protect firefighters in Hong Kong, Malaysia, Singapore, New Zealand and Australia, providing improved levels of comfort, while at the same time reducing the risk of heat stress.

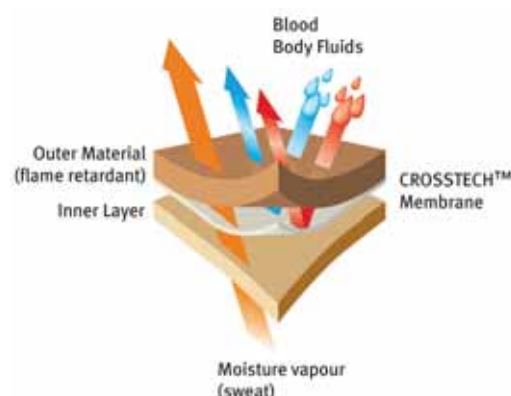
The introduction of Gore's high performance fabrics created a durable layer in PPE that keeps the wearer dry by preventing water from entering the garment, but allows sweat to travel out the other way. This minimises the build-up of moisture inside the garment and in those extreme conditions that are often experienced by firefighters and emergency responders and in turn reduces the risk of heat stress and burns. That is why Gore's fabrics are worn by first responders all over the world.

Research shows that the breathable membrane makes a significant contribution to the reduction of heat stress on the fire ground, as well as in a moderate to light duty environment for firefighters, who spend 80 percent of their time carrying out this type of work.

The moisture barrier is in a garment to perform key tasks simultaneously: The first is to prevent firefighters from getting wet from the outside in. The second is to keep the thermal insulation material dry, preventing build-up of body moisture that could reduce the level of protection from scalds. This means that the firefighter is more comfortable wearing their garment and has a slower body core temperature rise.

The pores in the GORE-TEX® and CROSSTECH® moisture barriers are 20,000 times smaller than a droplet of water but 700 times larger than a molecule of water vapour from perspiration. The fabric is a durable, waterproof barrier that is breathable. CROSSTECH® fabric provides additional protection from blood borne pathogens and common chemicals. The durability of the fabric ensures that it continues to perform over the lifetime of the garment, delivering the best protection to responders while still satisfying the "best value" philosophy.

The company developed AIRLOCK® Spacer Technology, which is available in both GORE-TEX® and CROSSTECH® fabrics and uses silicon spacers



to create an airspace that acts as a thermal barrier and replaces the heavier fibre version. This increases breathability and freedom of movement for the wearer.

Gore's technology also protects hands and feet in a wide range of specially developed, high-performance gloves and footwear worn by a range of specialist emergency responders and military personnel.

All Gore Fabrics exceed PPE performance tests. They maintain that level of performance thanks to outstanding resistance to wear and abrasion and an ability to consistently maintain high breathability and waterproofness after exposure to extreme heat. Gore products are renowned for their consistently reliable thermal stability. Gore has developed its own proprietary GORE-SEAM® tapes and seam sealing technology and quality assurance system to ensure the waterproof integrity of the garment's seams.

Companies that make Gore products must comply with Gore manufacturing standards. These standards require the manufacturer to comply with specific quality levels for machinery used in the manufacturing process. Each manufacturer also agrees to allow Gore to test garments to ensure that they meet quality standards for durability and performance.

Gore's philosophy is that: "our products will do what they say what they will do". The company's unique approach combines research, innovation and an unwavering commitment to quality that has resulted in state of the art protective fabrics that are fundamental to the protection of firefighters today, setting the benchmark in their class. CROSSTECH® and GORE-TEX® products lead the field in waterproof, breathable protection. **APF**

For more information, go to
www.gore.com

Hands-Free Visor Light System

ANSELL has announced the launch of the Trelchem hands-free visor light system, which offers HazMat responders in encapsulating Trelchem suits a built-in hands-free LED lighting solution with a panoramic view with no risk of blinding reflections.

The Trelchem system is a "short throw" illumination system based on a LED panel mounted along the top inside of the visor. It is connected to a standard 9V battery giving the user an expected duration of more than one hour. The wide beam of the LED panel creates a panoramic view in poorly illuminated environments. It helps the responder with better orientation as well as safer and more rapid performance since it frees up both hands. The design of the system eliminates any risk of

reflection back into the eyes of the user and mounts easily in both new and existing suits without the need of any special tools. The LED panel is powered by standard batteries to eliminate the need of any recharging management.



The system fulfils EMC requirements and does not interfere with any radio communication devices. Further, it does not influence or interfere with any regulatory certification regarding the Trelchem suit. For decontamination and cleaning purposes, once the battery pack

is dismantled, the system will remain unaffected inside the suit when being washed.

For more information, go to
www.protective.ansell.com/en/Products/Trelchem/Accessories/

Bushfire CRC Research to Drive Change

The BUSHFIRE CRC is taking an important step to ensure research findings from the past three years are accessible to a range of audiences. As part of the final phase of the Bushfire CRC, a number of documentary-style videos will be produced and online forums held to stimulate discussion and raise awareness of the various projects and their outcomes. The forums began in May, but will continue until September.

Topics covered include: bushfire community safety; next generation fire modelling; extreme fire behaviour; firefighter health and safety; ecology; incident management and economics to help decision-making. Each forum will feature leading researchers and industry end users discussing the research findings, what the findings mean and answering questions. Importantly, each video and forum will be accessible in the future, along with Bushfire CRC Fire Notes and more in-depth research reports, leaving a strong legacy.

Everyone is welcome to log on and attend the online forums free of charge.

For more information, go to www.bushfirecrc.com/drivechange

All-round Cutter Blade

HUSQVARNA has launched its FR-3 blade range for power cutters and angle grinders that incorporates one layer of vacuum-brazed diamonds that gives outstanding cutting performance in a wide variety of materials including iron, steel, concrete, plexi glass, rubber, timber and PVC pipe. The new blade range is claimed to offer superior cutting speed and improved safety when compared with abrasive discs.

Water Mist Conference

The 14th International Water Mist conference and exhibition will be held in Istanbul, Turkey on 22nd and 23rd October 2014 at the Lütfi Kırdar ICEC in the heart of the Turkish capital. Day one of the conference will be dedicated to applications only and will include a panel discussion on water mist technology. Day two will be "science & research" day during which experts from universities and research institutes will present new developments and findings. The highlight will be the presentation on the IWMA research project.

For more information, go to www.iwma.net

Continued Global Growth For PBI

PBI Performance Products is enjoying continued global growth as more fire and rescue services specify the company's outer fabrics as the preferred choice to protect their firefighters. PBI fabrics are internationally renowned for their exceptional flame resistance and thermal protection from radiant heat, built on a 30-year heritage of technical excellence and innovation.

Firefighters operate with the confidence protected by PBI in Australia, New Zealand, Asia, the Middle East, North America and much of Europe, including Scandinavia and Germany.

In Northeast Asia more and more fire brigades are choosing PBI outer shell fabrics to protect their fire fighters, recognising the high levels of performance and comfort. In Macau, firefighters have been wearing PBI fabrics for more than ten years after converting from their meta-aramid fire suits in 2003. Fire services in South Korea have been upgrading their fire suits with PBI Gold® fabric since 2010. After extensive testing and wearer trials, Hong Kong Fire Service Department chose PBI Matrix® as its protective outer fabric in 2010. In recent years, some brigades in Taiwan have also switched to PBI fabric to protect their firefighters.

The move to PBI fabrics has also continued across Europe with a number of recent new contracts. In Sweden, Gothenburg Fire and Rescue Service recently changed to PPE with a new outer fabric manufactured by Viking, choosing Ibena Neo® with PBI, which provides excellent tensile strength and tear resistance, along with the inherent protective properties of PBI fibre. In the UK, Manchester Fire and Rescue Service has also opted to protect its firefighters with PBI Matrix® fabric in its new PPE ensemble, designed and manufactured by Bristol Uniforms.

In the Netherlands, Rotterdam Fire Department's firefighters will be protected by PBI Matrix® fabric, which combines the high performing heat and flame protection of PBI Gold® with a durable matrix of high strength denier filaments to reduce wear and tear. The brigade's new PPE is manufactured by Texport. PBI Matrix® is also the preferred choice in Ireland, where Dublin Fire Brigade's firefighters will also benefit from the high standards of protection delivered by the fabric, supplied by Hunter Apparel Solutions.

In procuring their new fire-fighting ensembles, all of these fire and rescue services undertook



detailed and demanding evaluations, setting extremely high performance standards for the component fabrics, as well as the complete suits. In all of these tests and criteria, PBI fabrics exceeded the required standards.

PBI fabrics are lightweight, strong and achieve a high standard of flame resistance. They will not become brittle, shrink or break open when exposed to flame and high temperatures. This also means that the integrity of the internal layers of the garment is protected and the transfer of any radiant heat is slower, allowing more time for firefighters to escape to safety in a situation such as a flashover.

The outer fabric is the first line of defence in any protective clothing ensemble and has to be strong and durable to cope with the impacts and abrasions that come with the job. It does not matter how well a fabric protects the wearer if it will not hold up to the working environment. PBI fabrics are very durable with high tear and UV resistance. They have a proven track record of maintaining performance and protection levels throughout the lifetime of the garment and that high durability also helps to ensure low maintenance.

Ian Callaghan, Director of International Sales and Marketing at PBI Performance Products said: "The continued success and growth of the business across all of our markets is a result of the quality and performance of our products and the commitment of our team to work closely with fire and rescue services to fully understand their needs."

He continued: "The specialist knowledge and expertise that we have developed through close relationships with our fire service end users and supply chain partners over the last 30 years informs our continued innovation and product development."

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For more information, go to
www.pbiproducs.com





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Only **one** outer shell fabric is designed for mobility. PBI Max™ offers firefighters the best combination of break open and thermal protection—in the most flexible and comfortable outer shell fabric the world has ever seen. PBI Max, engineered with Filament Twill Technology™, allows firefighters to do more, more comfortably—all **without** the stiffness and stress experienced with conventional outer shell fabrics. PBI Max with Filament Twill Technology exclusively from Safety Components. Learn more **PBI^{Max}.com**



SAFETY COMPONENTS

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Global Progress on PPE Standards

Delegates from around the globe helped to ensure that international standards for PPE took a significant step forward when they met in Sydney at the end of July. More than 40 representatives from 12 countries and a further 30 observers were present for the International Organization for Standardization (ISO) TC 94 SC 14 meeting hosted by Standards Australia and the Australasian Fire and Emergency Service Authorities Council (AFAC).

Simon Burnett-Boothroyd

Hainsworth

During the intensive five-day meeting, a number of work programmes were either signed off or developed. One particularly exciting and substantial development was the decision to create a new transport rescue incident (TRI) standard that would provide the benchmark for firefighter PPE clothing in any transport related environment.

After a number of hours of discussion and debate, the SC 14 committee agreed to move forward under the TRI banner. The programme, which had previously been discussed at an SC 14 meeting in Edmonton, Canada, will now be developed to include a number of key areas including clothing, gloves, helmets and boots.

The momentum gained in Sydney will not be allowed to slacken with a strict timetable in place to ensure that the TRI programme is ready to be advanced when SC 14 meets again in 12 months' time.

International (ISO) standards are becoming increasingly important as the world continues to shrink. Firefighters from around the world now

routinely attend major disasters in other countries and continents, often facing very different fire-fighting environments to those they are perhaps used to at home. Indeed, this was brought home to delegates attending SC 14, who watched the tragedy of the Malaysian airliner shot down over the Ukraine while attending the conference. During August, firefighters from Australia were called to support the efforts of exhausted Canadian fire crews tackling large-scale wildfires in British Columbia.

The sense that the world is a much smaller place than it was even ten or twenty years ago is helping to drive the importance of ISO standards. The impressive attendance and wide range of countries at the SC 14 committee points to a realisation that the global firefighting community needs to work much more closely in order to ensure the best possible response to incidents. In time, this may mean a comprehensive set of ISO standards, but with territorial nuances to take proper account of varying firefighting environments.

PPE STANDARDS



Rather than lots of different standards depending on where you happen to be in the world, it is likely that we will move ever more towards a harmonisation of standards with the end goal that wherever you are in the world, there is a standard, a vital term of reference.

The most exciting and heartening aspect of the

recent SC 14 discussions was the appetite of the attending countries to engage in working together for the common good. There was a genuine sense that delegates understood the responsibility placed in them to educate and inform on a global level.

Meetings like SC 14 also provide the opportunity for leading manufacturers, such as Hainsworth, to monitor the latest trends in areas such as fire-fighting techniques and buying processes. One of the biggest changes we are seeing is the ever greater collaboration among fire services both in terms of sharing intelligence, supporting each other operationally and joining forces for purchasing their PPE.

While collaborative buying will increasingly become the norm, it is clear from various conversations that, long-term, value rather than short-term cost savings will be a key driver in the market. This is something Hainsworth and other leading manufacturers have argued for some time, namely that true value is to be found in quality products that are still performing as well as ever after several years. The industry preference would appear to be for highly engineered, innovative garments that last as long as possible, providing cost savings over the lifetime of the product.

Hainsworth was delighted to hear recently that the Country Fire Authority (CFA), which helps to protect over three million Victorians, is conducting trials of the company's wildland Eco-Dry Shield fabric, while Fire and Rescue New South Wales continues to provide its structural firefighters with Hainsworth Titan 1220.



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This month's AFAC in Wellington will have provided Hainsworth and other companies operating in the industry with the opportunity to continue the discussion around harmonisation of standards, collaborative buying, cost vs product durability, current and future technologies and many other topical issues.

There should be complete compatibility between the work of companies such as Hainsworth and the various standards committees around the globe. Both should be about driving quality – in innovation and product design – and improving the survivability of firefighters wherever they are in the world, and whatever firefighting environment they face. While the technologies that are harnessed to develop today's PPE and the discussions that go on around the table of committees such as SC 14 may, at times, be highly complex, no one working in the industry should ever lose sight of the very simple brief given to all of us. That is to ensure that firefighters are able to return home safely to their loved ones at the end of every working day.

By playing its part on various standards committees in Europe and elsewhere in the world and by continuing to innovate and develop new fabric technologies, Hainsworth has, over the past 150 years, aimed to be a lot more than merely a manufacturer. Hainsworth, and a small number of other established companies, are operating in a very specialist sector; one in which we are talking about the difference between life and death on a daily, indeed hourly, basis.

It should never be a cold, transactional business but rather one in which all parties – firefighters, procurement officials, manufacturers, standards committees and others – work in partnership to ensure that our fire crews are afforded the greatest possible protection.

APF

Simon Burnett-Boothroyd is Sales and Innovation Executive at Hainsworth

For more information, go to www.protectsyou.co.uk

WHEN YOUR NECK'S ON THE FRONT LINE WE'VE GOT IT COVERED

We know how important the performance of PPE is, so all our garments are designed and developed by our own experts to meet your exacting specifications.

Working with the finest fabrics available, and to International Standards for structural garments, Bristol constantly innovates to protect the world's firefighters and USAR teams.

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To find out more about our products and support services, call us on +44 (0)117 956 3101, email us at enquiries@bristoluniforms.com or visit our web site, www.bristoluniforms.com

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Response Pre-plan Software

StreetWise CADlink from HANGAR 14 SOLUTIONS is being heralded as a new breed of hybrid software for the fire and emergency services, combining response information with a full-featured pre-plan system. It is claimed to turn tablets into powerful mobile data computers through cloud-based server technology.

By integrating basic dispatch exports with a combination of local and public data stored in Hangar 14 Solutions' servers, StreetWise CADlink enhances situational awareness, resource coordination, incident command and the creation of an instant common operating picture for all responding units. Pre-plans are simple to enter, seamlessly synchronised to all devices, and displayed on demand with photos and attachments, all right on the tablet.

Its many features include: incident location and type are sent to assigned tablets with audible alert; incidents are



mapped automatically, with familiar "pinch-zoom" interface; AVL shows the location of other responding tablets/units in real time; community hazards are displayed graphically on the tactical map; navigational routing is available, with

turn-by-turn directions and unique off-line capability; and hydrant layer shows location and touch-to-display data for water supply. Other features include: switch to satellite photo view; Google StreetView is integrated for interactive 360° photo; tactical waypoints can be dropped on the map; and pre-incident plans are stored in the server and accessed on any responding tablet.

With StreetWise CADlink new pre-plans are automatically synchronized to the server for immediate use; pre-incident planning photos also push to tablet; instant photo "share" feature can send incident photos to other responding tablets; unit status

timestamps can be sent to the server for later retrieval; and agency log records every event and activity.

For more information, go to www.streetwisecadlink.com

New Rotary Rescue Saws



CUTTERS EDGE has introduced the new H² series rotary rescue saws that feature, the company says: "more power, improved air filtration, a full-wrap handle and a new EZ-Drage base design".

Along with the full-wrap handle the H² series has a textured rubber grip that helps create a solid grip in all cutting positions. The K & N filter delivers up to 300 percent more air, protects the engine from water and never needs to be replaced. The new EZ-drag base design enables smooth movement of the saw on roof surfaces.

The new H² Series is available in three models: CE760, CE970 and CE1260, and all models are equipped with the Black Diamond blade and the new Bulletblade will be available as an option.

For more information, go to www.cuttersedge.com

Foam is FM Approved

THE SOLBERG COMPANY has achieved FM approval on the company's Re-Healing RF3, 3% and Arctic 3x3% ATC foam concentrates.

Re-Healing foam concentrate is a high performance fluorine-free foam concentrate for use on Class B hydrocarbon fuel fires. It is also used to prevent re-ignition of a liquid spill and control hazardous vapours. The new FM approval includes bladder tanks, proportioners, foam chambers, foam makers and fire sprinklers. The FM approval with multiple standard automatic sprinklers includes Reliable F-1 upright and pendent style (5.6 and 8.0 K-Factors), Reliable Model G upright and pendent style (5.6 and 8.0 K-Factors), and the Reliable upright G XLO (11.2 K-Factor).

Re-Healing RF3, 3% foam concentrate is both UL Listed and FM approved for use in automatic sprinkler systems at exactly the same application rates and sprinkler operating pressures as Aqueous Film Forming Foam (AFFF) concentrates. Equal system performance has been achieved with a completely fluorine-free foam concentrate that also happens to be high performance firefighting foam.

In addition to the FM Approval on Re-Healing RF3, Solberg also obtained FM approval on Arctic 3x3%ATC foam concentrate, for use with foam chambers, foam makers, and the same sprinklers as identified for Re-Healing RF3. Arctic foam concentrates are 2015 compliant to the U.S. EPA Stewardship Program on C6 fluorine chemistry.

For more information, go to www.solbergfoam.com

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PBI Around The World!

Every day, firefighters around the world risk their lives to protect the property and lives of others. As these brave men and women place their lives in harm's way, PBI fibres play an integral role in firefighter safety. High performance outer shell fabrics with PBI fibres provide essential protection from heat and flame. PBI outer shell fabrics are EN and NFPA approved, and will not shrink or become brittle when exposed to high temperatures. PBI fabrics deliver high levels of comfort and durability. Choose from PBI Gold®, PBI Matrix®, PBI Max™, TenCate Gemini™, Ikena Neo®, or Titan 1260™. For detailed technical information regarding PBI products, contact us at international@pbiproducts.com.

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PBI Max™ by Safety Components

Innovative Filament Twill Technology™ Revolutionises Firefighter Garments

Question: You launched PBI Max™ in mid-2012 at the FDIC Show in the USA. How has the reception been to a new PBI product?

Answer: The success has exceeded everyone's expectations. After just 24 months, we have seen about 70 percent of our PBI sales shift from the out-dated rip-stop technology used in PBI Matrix®, to our exclusive Filament Twill Technology™ featured in PBI Max™. We have seen more major metro city conversions over the past 24 months than ever. In North America, Baltimore, San Francisco, San Diego, Montreal, Philadelphia, Phoenix, Tucson, Kansas City, Wichita, Portland, Seattle, Mobile, Palm Beach, Honolulu, Broward County and many others have all made the switch.



Question: Why the quick success?

Answer: Textile companies have focused solely on protection for years. Firefighters needed other improvements. Safety Components listened to those needs and developed a lighter weight fabric with maximum comfort and mobility, better tear resistance for lower repair costs and better garment durability – all while improving thermal protection for the firefighter. All you have to do is wear it to appreciate its values.

Question: That sounds pretty revolutionary. How does it work?

Answer: Well, first, we do not do traditional. We do original. After years of research and trial work, we decided the standard, all spun and somewhat stiff rip-stop weave outer shell is dead. We believe in combining filament yarns with re-oriented spun yarns and capturing the best values of each fibre. We structure these yarns in such a way to maximise fabric flexibility and durability and we never sacrifice thermal protection. It is an all-win equation for the firefighter.

Question: Is PBI Max™ the only fabric you make that incorporates the Filament Twill Technology™?

Answer: We just introduced Armor AP™. It is a meta-aramid/para-aramid blend that utilises the Filament Twill Technology™. It is a 220-gram fabric with incredible flexibility and durability and very



good thermal protection. It is a value priced product. We are already having a huge response for this fabric in North America.

Question: How about the potential for Europe and Asia for this technology?

Answer: The potential and the demand is there. We launched PBI Max™ in Europe in mid-2013. It takes a little more time in international markets for new product success. However, we are in the fire service market for the long term – and this means Europe, Australasia, the Middle East . . . not just the Americas.

Question: In your development process, what led you to Filament Twill Technology™ for PBI Max™ and Armor AP™?

Answer: It has been a journey. We have a passion for raising the bar and we learn from many trial developments, some successful some unsuccessful. We started with our patented water repellent technology and PBI Gold® Plus in 1998, introducing the use of producer colours in 1999 with Fusion™, developing a high lubricity and excellent moisture management thermal liner with Glide™ in 1999, and pioneering the use of filament aramid in PBI Matrix® and Armor 7.0™ in the early 2000s. The lessons learned along the way led us to PBI Max™ and Armor AP™. APF



For more information, go to
www.safetycomponents.com

ruwu Mobile Fans

An increasingly well-known and well-respected brand around the world. But, how did this come about?

Hans-J. Ru wurm, owner of German medium-sized company, Rußwurm Ventilatoren GmbH sums it up by saying: "We are a company that successfully specialises in developing client-specific portable fans for fire brigades fans."

While the new developments are best suited to meet the needs of firefighters, they can be also be used for ventilation or additional cooling of machines or rooms. Easy handling, low weight and compact dimensions ensure the suitability of these high performance fans for fire brigades that must immediately gain control of critical life or property threatening situations. This is particularly so where health-threatening fumes or explosive gases or poisonous steam is present, or where there is the need for an immediate fresh air supply, or when there is limited space in the transporting vehicle or at the incident site.



More and more fire brigades have come to trust Rußwurm's competence, rely on "Made in Germany" and use robust and maintenance-free high performance ruwu fans. They are small but powerful and proven in the most extreme fire and rescue conditions.

As Individual as your Needs

Three different series ensure the most suitable fan for each application. In addition to manufacturing standard fans, Rußwurm develops and produces special models individually designed to the particular customer's needs; from the inexpensive new MWM 150 E, the ultra-compact entry-level model with folded spiral casing made of aluminium, to the brand-new explosive-safe pressure aerator VM 600 D ex with spray adapter.

The experienced ruwu engineering team plays a significant role. With years of expertise, inventiveness and communication skills, it develops the most economical solution together with the customer, which is then translated into the finished product.

Radial Design with Hose Connection

The new MWM series is ideal when the need is for higher pressure. This series offers the largest variety of drives and nominal sizes. AC, DC, explosion-proof and even combustion engines – for every application Rußwurm offers the optimum solution.

The Advantages:

- Light-weighted design made of aluminium.
- Wide stable area of fan curve for use in ducting longer than 35 metres.
- Certified ex. acc. to ATEX, RL 94/9 EG: Category II2G e II T3 or II2D T< 60°C.



Axial Design with Hose Connection

When compact construction measurements are required, the axial fans of the **VL, VM series** are recommended. Axial fans of VL series distinguish themselves with very high volume flows and compact design. The new stable lightweight VL 500 D ex is made completely of aluminium! They are available only as explosion-proof. They are the right choices for extraction of pure gases and vapours, ventilation of confined spaces, supply of fresh air or cooling of machines.

The Advantages:

- Conforming to standards for fire trucks acc. to DIN 14555.
- Certified explosion protection acc. to ATEX RL 94/9 EG: Category II2G e II T3.
- Extremely sturdy design made of steel plates.
- High efficiency thanks to guide vanes.

Pressure Aerator with Power

There are two sizes of fans for pressure aerators (PPV) for fire brigades: electro motor and explosive safe in a high performance version. The ruwu PPV-fans of the VM series are available in three models:

- The VM 315 D ex, the smallest fan for use with ducting.
- The VM 400 D ex with its compact design is easy to stow in most vehicles.
- The VM 600 D ex, the first portable fan for positive pressure ventilation with spray adapter made in Germany.

The Advantages:

- Certified explosion protection acc. to ATEX RL 94/9 EG: Category II2G e II T3.
- Easy to use and to move due to solid tires.
- Maintenance free.
- Sturdy metal design made of aluminium and steel.
- Air stream adjustable in a wide range, even vertical operation is possible. **APF**

For more information, go to
www.ruwu.de



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THINKING AHEAD

firefighting series



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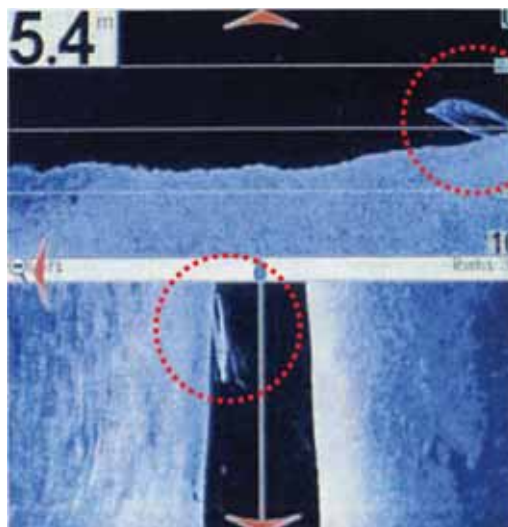
— SINCE 1953 —

Yone Sensor Aids Water Rescue Attempt

In June, when members of the Yone Corporation team were in Indonesia to give a presentation on the company's new search and rescue product, the Proeye 751-SNR Sonar Plus, they were asked by the local rescue team in Balikpapan – a seaport city on the east coast of the island of Borneo in the Indonesian province of East Kalimantan – to assist in a maritime search and rescue on very short notice.

The Yone Corporation team rushed to the scene, and began the search around the mouth of the Balikpapan River. A Proeye 751-SNR Sonar Plus sensor was lowered into the water from a small boat, and a sonar display was used to perform the search.

The water in the river was considerably cloudy, so the search was not without its difficulties, but a little over two hours later, the form of the victim was confirmed on the sonar display as being at the bottom of the river, about five meters down. As the sun had begun to set, the position was confirmed with the GPS function of the Proeye 751-SNR Sonar Plus in preparation for the following day. Unfortunately, the victim was found dead the following morning, but the local Balikpapan rescue team and others involved expressed gratitude for the coopera-



Both downward and side views are displayed on the sonar image display. On the top left, the depth of the water is displayed. From the screen, it can be seen that despite the considerable cloudiness of the water, the images are mostly unaffected. Additionally, the screen shows that the bottom of the river is relatively smooth, the victim is lying at the bottom at a depth of around 5.4 meters and the position is directly under the search boat and on the left in the direction of travel.)

tion of our staff in the search and rescue work.

Thanks to the side imaging and down imaging technologies incorporated into the Proeye 751-SNR Sonar Plus sonar system, rescue personnel in a boat are able to safely and rapidly locate and visualise targets such as sunken boats, vehicles and accident victims, often in a matter of minutes. The remotely controlled underwater camera head has 270 degree articulation and is designed for depths of up to 50 metres. It can be placed directly into water or, optionally, by attaching it to the telescoping rod. An integral GPS system indicates the exact location on the system's sonar display.

The system is powered by a rechargeable 12-volt rechargeable battery that provides an operating time of between one-and-a-half hours and two hours. As standard, the camera comes with a ten-metre cable, and the Proeye 751-SNR Sonar Plus sonar system is housed in the control box, which measures 560mm by 455mm by 265mm and weighs just 14.5 kilograms.

The Yone Corporation is headquartered in Kyoto, Japan and manufactures and markets a broad range of firefighting, disaster prevention and search and rescue equipment. **APF**



For more information, go to www.yone-co.co.jp

YONE

PROEYE 751-SNR

SONAR Plus™
PAT.P

**Search out by SONAR and pinpoint
with the Underwater Camera Head!
Great result in dark and cloudy waters!**

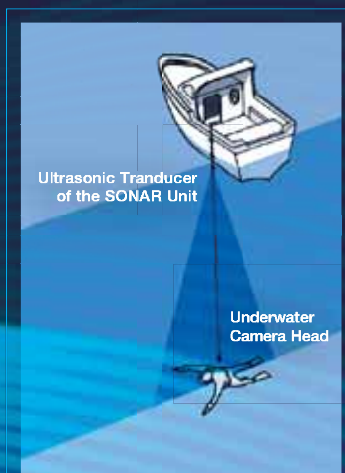
With the unique PROEYE 751-SNR SONAR Plus, operators can see sonar images from the SONAR System and real-life images captured by the Underwater Camera Head at the same time. The forefront technologies built into SONAR provides clear images even when searching the dark or cloudy waters of lakes and rivers.

The system is designed compactly for optional use for various types of search & rescue operations.

GPS System indicates exact location on the display.



SONER Display image



YONE CORPORATION
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Bristol's New Structural Firefighting Gloves

In a further extension of its own-manufacture product strategy, Bristol has designed a range of three structural firefighting gloves to meet EN659:2008 and which have focused on providing class leading protection and manual dexterity.

The new gloves, which have been designed by Bristol's in-house design team as part of Bristol's new product development programme, have been fully tested by UK firefighters before going into production and will be available in three different fabric combinations. A robust development programme included extensive trials on alternative material combinations as well as the cut, finger shaping and overall dexterity of the fire gloves.

The first product will be available towards the end of 2014, which is an all-black, soft, flexible leather design incorporating a Gore CROSSTECH membrane with a Kevlar lining. Special features include silicone finger and palm grips and a knitted Nomex cuff. Independent testing has shown the glove to score exceptionally well in cut and tear resistance:



Test type	EN standard	Score
Cut resistance	EN388	5
Abrasion resistance	EN388	3
Puncture resistance	EN388	3
Tear resistance	EN388	4
Dexterity	EN420	4

Two other gloves in the range, which will be available in 2015, will incorporate Hainsworth Titan fabrics – the former using Titan PBI 1260 and the latter a Titan 1220 in red. In common with the leather glove, these both include a Gore CROSSTECH membrane with a Kevlar lining. Identifying features include silicone palms, reflective piping, knuckle protectors and knitted Nomex cuffs. With similar overall rating scores, the individual standard test scores are:

Test type	EN standard	Score
Cut resistance	EN388	4
Abrasion resistance	EN388	4
Puncture resistance	EN388	3
Tear resistance	EN388	4
Dexterity	EN420	4

All three gloves in the range will be available in a wide range of sizes from six to 12 and XXS to XXL.

Commenting on the planned launch, Roger Startin, Bristol's joint managing director said: "This new fire glove range is further evidence of our long term plan to use our in-house design experience and capability to bring more own-manufactured firefighter PPE products to market beyond our traditional ranges of specialist coats and trousers. Previously Bristol's new product development has seen the introduction of fire hoods and a firefighter motorcycle suit in 2012 followed by our new EN469:2005 Level 1 firefighter motorcycle suit earlier this year."



Bristol Uniforms Ltd, founded in Bristol in 1801, has been, and remains, the UK's leading designer and manufacturer of protective clothing for municipal and industrial firefighters both in the UK and abroad with around 50 per cent of sales being exported to over 110 countries across the world.

APF

For more information, go to www.bristoluniforms.co.uk

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The new Dual-Air intake engine technology significantly improves overall cutting performance and meets all Air Quality Control standards at the same time.

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New 2100 Series includes two engine sizes: 70.7cc and 87.9cc.

Each engine is designed for use with Cutters Edge Carbide

Tipped BULLET Chain® to cut the widest range of materials found at fireground and rescue scenes.



MULTI-CUT® H Series Rotary Rescue Saw

New H Series is engineered and powered to work harder and operate longer in the most extreme fire and rescue conditions anywhere.

The new technology engine is available in three sizes: 74cc, 94cc and 119cc. The Cutters Edge Black Star and Black Diamond Blades offer long cutting life and high speed cutting of virtually all materials.

The new **BULLET BLADE™** is available soon.

CE94 Concrete Cutting Rescue Chainsaw

A new technology 94cc engine and a new style Diamond chain cuts reinforced concrete up to 16-inches thick. Features a lighter weight power head and full-wrap handle for high performance concrete cutting in any position.



All Cutters Edge NEXT GENERATION TECHNOLOGY Fire Rescue Saws are available in fully-equipped Field Kits designed for Rescue Cutting anywhere.



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Technology
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FIRE RESCUE SAWS

Division of Edge Industries

Power Redefined

New Spreader SP 53 BS from Weber Rescue Systems

During Intersec in Dubai, fire and rescue personnel saw at first hand the SP 53 BS, the most powerful spreader in the world in terms of weight, spreading distance and cutting force from Weber Hydraulik, based in Germany and Austria.

The SP 53 BS has some stunning characteristics. It boasts a minimum spreading force of 53kN at the tip (the standard BS type requires at least 50kN at tips) and the spreading distance is an impressive 800mm – the widest spreading requirement under European standards. What makes the SP 53 BS really special however is that it achieves this performance with a weight of only 20 kg.

Export manager, Reiner Anritter explained that Weber Rescue has managed to shave approximately 5 kg off the previous version of this spreader through the use of the latest generation of aluminium alloys. "People don't normally look too closely at the exact EN classification of spreaders, but what they are looking for is the right ratio of power, weight and spreading distance. We have achieved the lightest BS classification worldwide."

According to European standard EN 13204 (*Double acting hydraulic rescue tools for fire and rescue service use – Safety and performance requirements*), spreaders are split into three types,

- ul>
- each with the following performance requirements:
- **AS type:** minimum spreading force at tips (kN) 20, minimum spreading distance 600mm.
- **BS type:** minimum spreading force at tips (kN) 50, minimum spreading distance 800mm.
- **CS type:** minimum spreading force at tips (kN) 80, minimum spreading distance 500mm

Other characteristics of the SP 53 BS include a special tip design (with struts) that helps avoid slip-page during spreading, as well as a captive pin. The captive pin – or bolt – makes changing tips easier because the bolt cannot be completely disengaged from the spreader and therefore cannot be lost.

The new spreader will be available worldwide, including the USA, where it will be marketed under the brand name 'Genesis'. North American firefighters had the chance to see the new spreader at the FDIC in April in Indianapolis. "The feedback so far has been tremendous with all firefighters remarking that they want it in the future," concluded Reiner Anritter. **APF**



For more information, go to www.weber-rescue.com



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TEAM *gold*

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redefined

SP 53 BS

Most lightweight
BS spreader (EN norm)
worldwide!

Easily meets the highest
requirements of the
EN and NFPA standards.



www.weber-rescue.com

WEBERRESCUE
SYSTEMS

The Siemens logo is displayed in a white rectangular box in the top left corner of the advertisement. The background of the entire advertisement is a photograph of a grand, ornate interior space, likely a historical building or museum, featuring a high ceiling with intricate plasterwork, several large, multi-tiered chandeliers, and dark wood paneling. A large, ornate, cylindrical object, possibly a safe or a decorative structure, is visible in the center of the room.

SIEMENS

ASD from Siemens – invisibly efficient

Innovative technology for early fire detection with
outstanding reliability

www.siemens.com/asd

Aspirating smoke detection (ASD) continuously draws air samples from the areas requiring protection and evaluates these for the presence of smoke. The new aspirating smoke detectors from Siemens offer highest reliability and immunity to deceptive phenomena, thereby preventing downtimes and costs caused by false alarms.

The aspirating smoke detectors are particularly suitable for application areas where environmentally challenging conditions prevail, where an aesthetically appealing solution is desired or where high detection sensitivity is needed. Furthermore, the detectors can be directly integrated into a fire detection system from Siemens.

Answers for infrastructure and cities.

ASD is able to distinguish between dust and smoke, even in the most demanding application



ASD – Rising to the Most Demanding Challenges



James Ivanovski

Siemens Building Technologies Division

Everybody knows that fire always has the potential to be a real threat to both life and property. It is therefore vital to know that personnel and property are reliably and efficiently protected from its outbreak wherever possible. However, should the unthinkable happen and the circumstances come about for combustion to occur, the very least that we would all want is the assurance that we receive the earliest and most reliable detection possible.

It is generally accepted that aspirating smoke detection (ASD) is one of the technologies that provides the earliest detection of the incipient stages of combustion. Aspirating smoke detection systems – also widely known as air sampling detection systems – can detect smoke before it is even visible to the human eye.

The systems generally consist of a network of independent pipes with one or more sampling apertures that actively draw air into a highly sensitive smoke-sensing chamber. There, the sampled air is precisely and accurately analysed by a scattered-light detector for smoke particles. If smoke particles beyond a pre-set threshold are detected, the system triggers an immediate alarm. In that way, a timely warning is given, along with the opportunity to fully investigate the cause of the alarm. The most appropriate response can then be initiated to stop the fire gaining a hold and so prevent injury, damage and disruption to business.

Aspirating systems can be up to a thousand times more sensitive than a standard point detection system. By combining this level of sensitivity with an

environmental learning capability, it is possible for such a system to provide and maintain the optimum operating level and keep unwanted or false alarms to an absolute minimum – without external input. Aspirating systems also usually have the capability to monitor their own integrity and, in the event of the system's ability to detect smoke being compromised for any reason, an alert is raised. Conventional point detection usually comprises passive devices that are simply constantly monitored. The systems have no ability to determine whether any occurring smoke will actually reach the detectors.

An Alternative with So Many Applications

Aspirating smoke detection is no longer a new technology, having been tried and proven in many different applications. Nor is it simply an alternative option to standard point detection, which is generally more than suitable for most standard applications where cost and basic compliance to regulations are often the main selection criteria.

Aspirating detection is still very widely used

ALARM TECHNOLOGIES

In data centres, smoke dilution and redirection because of high ventilation can mean that smoke cannot reach a conventional detector fast enough



within IT and telecommunications environments – the arena for which it was originally developed – protecting highly ventilated areas such as data centres, information technology and computer centres, telecommunication facilities, laboratory and research centres, electronic measuring rooms, transformer rooms and clean rooms.

In these mission-critical facilities, high power loads and minor deficiencies in the electrical equipment can lead to short circuits or dangerous overheating. However the dilution of any resulting smoke and any redirection of it by the vigorous airflow would most likely prevent any signals of combustion from reaching conventional detectors in adequate time or in sufficient quantities to trigger an alarm. In the event of a substantial fire breaking out, the potential loss in either a data centre or server room might not be just the important or irreplaceable data they hold, but also the

significant revenue for its safe storage along with the IT company's reputation.

Release of Gaseous Extinguishants

In these IT areas, such as electrical control rooms, substations, computer, server and telecommunication rooms, wherever gaseous extinguishing systems are employed, codes of practice now call for two levels of detection before the release of extinguishants. This "coincidence" or "double-knock" protection as it is known, can utilise two independent detection systems, designed for one to confirm the other (double-knock).

High Power and Heavy Ventilation

However, it is not just IT environments that are heavily ventilated these days. Many buildings today are served by close-control air conditioning systems that operate with high-velocity airflows. These

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For historical buildings, where an aesthetically appealing solution and high detection sensibility are needed, ASD is the ideal solution

strong currents can effectively prevent any smoke generated in the first stages of a fire from reaching conventional detectors. This is particularly true of the incipient stages of combustion when “cool” smoke lacks the thermal lift to rise to the ceiling, where smoke detectors are traditionally sited.

Installers of aspirating systems can overcome these problems by siting the sampling apertures of the pipework within the airflow produced by the air-conditioning units – usually with most effect in front of the intake grill or duct for expelled air. In this way the quickest and most certain of responses is generally assured.

Detection Under Difficult Conditions

Aspirating smoke detection systems are ultra-sensitive, quiet and unobtrusive – qualities that make them suited for a multitude of applications and there are now many other applications, environments and conditions where today's prevailing considerations make aspirating detection a more viable and effective option than standard point detection. As well as affording the earliest warning, aspirating detection systems are also particularly suited wherever environmentally challenging conditions prevail, limiting the effectiveness of standard detectors.

There are applications where conditions are extremely hot or cold, wet or dusty. There are places with unusual or hard-to-access areas like intermediate ceilings, raised floors, cable ducts, distribution cabinets and display cases. Unlike traditional point detection systems, the detection units of aspirating systems do not need to be situated in the protected area. Only the sampling pipes are located within the area, continuously extracting air and carrying it to the detection chamber for analysis. This makes aspirating systems ideal for use in applications traditionally difficult to protect with conventional detectors such as textile drying areas, tobacco plants, cold stores and food preparation areas.

The ability of most systems to filter out dust particles completely enables them to perform highly effectively in even the dustiest locations while still keeping unwanted alarms to a minimum. This means they can even be installed for use in recycling facilities, paper and flour mills, coal conveyors, wood recyclers, cable tunnels and textile areas.



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ASD keeps unwanted or false alarms to an absolute minimum



Even Greater Reliability

Providing the earliest warning in harsh environments coupled with absolute reliability, however, is still a real challenge, but there are now available aspirating smoke detectors that can distinguish between smoke and dust – even in the most demanding application areas.

In the past, even for aspirating systems, differentiating between airborne particles of smoke, dust and steam has led to the generation of too many unwanted alarms. Now, new models of aspirating detector combine optical dual-wavelength technology with patented detection chamber technology. The new optical technology utilises light of two differing wavelengths. This enables the detection of the smaller airborne particles produced in the earliest stages of overheating or open flame. By determining the exact size and concentration of the actual airborne particles, the detectors are able to distinguish between smoke, dust and steam. As a result of this analysis, they are able to detect smoke in the very early stages of combustion reliably – with a high immunity to other deceptive phenomena. Such early, accurate and reliable detection – that is largely immune to external interference – can eliminate the downtime and resulting costs of unwanted or false alarms caused by steam, dust and other misleading airborne conditions of hostile environments.

Some of the new models can provide up to three modes of operation, such as: 'ultrasensitive', 'auto-discrimination' and 'robust'. Depending on the application, it is possible to choose between ten different parameter sets. To make sure the extinguishing is triggered at a higher obscuration level, a separate parameter set is available for this purpose. The new detectors are easy to install and their integration into existing systems is also possible in order to ensure full transparency of both display and operation. Integration makes it possible to configure the detectors, perform maintenance work and handle alarm and fault management on the system's control panel, thereby optimising control and lowering overall costs.

Protecting High Spaces

In large spaces, such as lobbies, atria, high-rack warehouses, distribution centres, industrial production areas, airports and hangars, ceiling heights in excess of 12 meters can make the use of conventional detectors totally ineffective. Stratification – the term used when smoke sits in a layer well below the ceiling – occurs when smoke does not have sufficient thermal buoyancy to reach the ceiling

where detectors would ordinarily be situated.

Beam detectors are sometimes used in this kind of scenario in place of ceiling-mounted detectors, but they are inherently low in sensitivity and also prone to false alarms caused by building movement, airborne activity and high-level operation of equipment such as cranes or forklifts interrupting the beams. Maintenance of ceiling-mounted detectors at these kinds of heights is also fraught with difficulties.

Maintenance is, of course, vital for any detection system to carry on operating in optimum condition. In the case of conventional point detectors, the high number of devices covering any area or the inaccessibility of their positioning can create all kinds of practical difficulties. In some instances, such as public buildings, areas or even the whole buildings often need to be closed for maintenance to be safely undertaken. The positioning of the detection chambers of aspirating systems being away from the protected area, means that access is often much easier. This is particularly true of high ceilings, but under floor voids, escalators and other inaccessible areas that can also benefit from the easier maintenance of aspirating systems.

Dependable yet Unobtrusive

There are those places too where an aesthetically appealing fire protection solution is desired or where high detection sensitivity is needed for the protection of cultural assets. In historical buildings, museums, galleries, theatres, cinemas, artefact collections and archive rooms, the items and assets housed there are often irreplaceable.

Sometimes, in historically important buildings with ornate interiors such as cathedrals and palaces or places of aesthetically sensitive architecture, the systems put in place must also respect the historic significance and visual and aesthetic appeal of the settings, which are often complex and unique. In prisons and correction centres, systems need to be as unobtrusive as possible or concealed for a much different reason. In these cases, the less visible the systems are the better, in order to avoid the wanton vandalism of detectors which is often a recurring problem in penal institutions.

By using capillary tubes to carry the air to be sampled to the system's pipe work, aspirating detection systems can be barely visible to even the most enquiring eyes. The capillary tubes can be flush terminated or easily hidden within features such as light fittings on the ceiling because the sampling tubes are so small.

Conclusion

Aspirating smoke detection originally developed for use in the IT industry to provide the earliest possible and most reliable detection in highly ventilated environments, has since been implemented with great success in a diverse range of applications – from heritage buildings and retail complexes to flour mills and metro stations. Its ability to detect combustion in its very earliest stages means that it can be used with efficient and timely extinguishing systems to prevent fires rather than simply detect them. Its high detection reliability and its immunity to deceptive phenomena make it the ideal choice in many difficult and challenging environments. The practicalities it brings for maintenance and unobtrusive detection makes it the preferred option to standard point detection and other systems in so many more.

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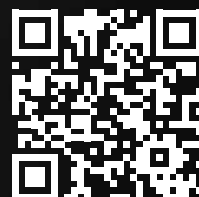


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Queensland's Academy Delivers Emergency Services Training



Graham Collins

The School of Fire and Emergency Services Training at Whyte Island in Brisbane, run by Queensland Fire and Emergency Services, is the largest and most sophisticated of its kind in the Southern Hemisphere, providing leading-edge training for emergency response personnel from across the State, Australia, and internationally. Asia Pacific Fire's editor recently visited the facility and learnt first-hand from the facility's director, Acting Chief Superintendent Roger Bird, how this training is delivered and how the Academy responds to an ever-growing number of emergency challenges.

The first thing you notice about the 5.6 hectare Whyte Island Academy is that it is located in one of Queensland's high-fire-risk industrial locations; east of the State capital, Brisbane, Whyte Island is home to the city's extensive Port of Brisbane facilities. What is not so immediately apparent is that, despite its appearance of being operated by the Queensland Fire and Emergency Services (QFES), since 1st July this year it switched to come under the banner of the State's Public Safety Business Agency. More than that, the training offered at the facility is not limited to just fire and rescue professionals – it embraces all of the emergency services, including paramedic, police and the State Emergency Service (SES) personnel.

So much so, that the Academy is sub-divided into five separate commands. These are the core operational training command; the strategic train-

ing command; the volunteer emergency services training command; the emergency management training command; and finally the operation's business command. Of these five commands, the volunteer emergency services training command and the emergency management training command are relatively new entities.

- **Core Operational Training Command**

This command is responsible for recruit firefighter training, the Academy's firefighter and officer development programmes, auxiliary (part-time) firefighter development, and fire communications training.

- **Strategic Training Command**

Originally called the "specialist" command, this now embraces the Australian Inter-Service Management System incident management unit, executive development, and the Academy's tactical training unit.

- **Volunteer Emergency Services Training Command**

In many ways, this command reflects the importance of the rural fire service and volunteer emergency services in the State. Queensland is the second-largest and third-most populous state in Australia, with a head-count approaching five million and covering an area of 1,852,642 km². That is five times the size of Japan, seven times the size of Britain, and two-and-a-half times the size of Texas. There are currently around 35,000 rural firefighters and 6,000 SES volunteers – volunteers who respond to emergencies and disasters across the State.

Much of the work of this command takes place away from the Whyte Island site, within the seven regions across the State.

- **Emergency Management Training Command**

This command was established in response to the incidence of natural disasters experienced across the State, particularly cyclones in the tropical north and flooding across the State. Its workload embraces liaison with the QFES and local disaster management groups and is focused around disaster management legislation.

- **Operations Business Command**

This command effectively runs the Academy day-to-day.

Training

The facilities at the Academy include an education centre that uses traditional classroom, video, online training techniques and website-based e-learning, enabling the Academy to outreach training to the State's rural communities. This engagement with the emergency services community and the public is strengthened via the Academy's website at www.sfrst.org, which contains a vast array of firefighting and emergency response training videos.

Other facilities include a live fire and rescue campus with simulated risk environments and props that include a ship interior, a service station, a gas processing plant, a collapsed building and an array of RTA and heavy vehicle accident scenarios. It also has a vertical rescue tower for rescue training and elevated hose operations, and incorporates a number of simulated industrial, commercial, retail and residential environments that can be reconfigured to expose those undergoing various levels of training with a wide variety of hands-on training to build on the lessons learnt in the classrooms.

In keeping with the Academy's integrated approach to joint emergency services training, the site also has a simulation of a surgical operating theatre to ensure that trainees learn to appreciate the need for inter-agency teamwork. The Academy is heavily involved with AIIMS (Australasian Inter-Service Incident Management System) incident management system for Australia's fire and emergency service agencies, and works closely and shares information and experience with organisations such as AFAC (Australasian Fire and Emergency Service Authorities Council) and Texas A & M University in the USA.

During the year, the Academy delivers around 33,000 training sessions – both on-site and off-site – around 70 percent of which is fire and emergency service related and 30 percent for commercial organisations mainly in the power generation, utilities and petrochemical sectors. The operation

is JOIFF (an international organisation for industrial hazard management) accredited – in fact it is currently the only JOIFF accredited organisation in Australia. It is also uses the five-star accreditation by the National Safety Council of Australia (NSCA) and INSARAG (International Search & Rescue Group), a global network of more than 80 countries and organisations under the United Nations umbrella.

The training offered embraces every type of fire or emergency. In addition to the firefighting skills required for tackling structural, bushfire, high fuel load, military, marine and aviation fires, the Academy offers training in urban search and rescue (USAR), confined space rescue, special technique and technical rescues (such as collapsed trench, shoring techniques, water and rope rescue), the use of BA (breathing apparatus) equipment and thermal imaging cameras, road traffic accident extrication, hazmat (hazardous materials) operations, disaster response and the research and development of turn-out gear (PPE – personal protection equipment).

Significantly, much of this training is multi-agency, integrating firefighters with paramedics, the police and other emergency agency staff. This is delivered by 80 permanent staff (25 of which operate away from the Whyte Island site), 200 part-time staff and 30 seconded staff, and can last from just a single day to many months depending on the training being delivered.

Research

The Academy is also at the forefront of firefighting, fire training methods and fire behaviour research, monitoring, analysing and assessing the performance of fire suppression materials, systems and techniques to better protect emergency personnel, those at risk in an emergency, the environment and property. This research facility also evaluates national and international search and rescue procedures and training methods as a prerequisite to developing ever more efficient, safe and effective USAR training programs and facilities.

This aspect of the Academy's work has become more important in recent years with the advent of new construction materials, innovative building techniques and the adoption of fire engineering principles, together with the increase in urbanisation whereby industrial premises, retail developments and residential buildings are now often in closer proximity with each other.

The development and increasing use of plastics and other synthetic materials, and the increased storage and transportation of highly flammable materials, such as LNG (liquefied natural gas) and LPG (liquefied petroleum gas), has led to the Academy to research the fire and smoke generation behaviour and toxicity of these substances. Similar research attention is also being given to the new high-performance materials that are being incorporated into new motor vehicles to ensure that the Academy's training in the use of hydraulic extrication equipment and techniques is in line with these developments.

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I am indebted to Chief Superintendent Roger Bird, Director of the School of Fire and Rescue Services Academy at Whyte Island and Superintendent Ricky May, Executive Manager of the Academy's Strategic Training Command for their unstinting assistance with this article.

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FireVu's controlled tests at the Sydney Harbour Tunnel showed how critical fire detection technology is. (Image courtesy of the Road and Maritime Service, Sydney)



Ali Aleali

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Tunnel Fires

Why they are vulnerable to disaster, the consequences and possible solutions

Major tunnel fires can be catastrophic with the scale of lives lost and property damaged. The particular nature of fires in such confined spaces presents special challenges for fire engineers, health and safety professionals and emergency services.

In March this year, more than 30 people died after an explosion and fire engulfed dozens of vehicles in the Yanhou Tunnel in China. A coal truck rear-ended one of a four-tanker convoy loaded with highly flammable methanol. The collision resulted in a fire and explosion, which engulfed more than 40 cars and commercial vehicles. While we do not know the full economic consequences this particular tunnel fire, to give an idea of the costs of tunnel fires we can go back to Europe for a moment.

The Channel Tunnel fire in the UK in 2008 lasted 16 hours and cannot be described as a particularly major fire. Yet, repairs cost €60 million and the loss of business through disruption to rail services was €200 million. The horrific Mont Blanc Tunnel fire on the France/Italian border that claimed 39 lives resulted in multi-million Euro fines for the companies involved and custodial sentences for senior executives responsible for safety.

The potential consequences of railway tunnel fires, both materially and in terms of loss of lives often exceed such road tunnels disasters.

Thankfully road and rail tunnel fires that lead to major catastrophes like these examples are relatively rare, particularly when thinking about the considerable levels of traffic they accommodate. Yet, when disaster happens it can be particularly costly in terms of life and property, as well as causing substantial disruption lasting months and even years.

Surge in Road and Rail Tunnel Construction in Asia Pacific

The Asia Pacific region has experienced an impressive boom in tunnel building for rail and road transport in the past 20 years. The transportation tunnels – metro, rail and road – that have been built are incredible endeavours as shown by the following examples.

The Guangzhou Line 3 at 60 kilometres is the

longest metro in the world. It is followed by the Beijing Subway at 57 kilometres. There are plenty of Chinese and Korean underground metro tunnels that closely follow in scope. Seikan Tunnel, 23.3-kilometre with a long portion under the seabed, is both the longest and the deepest operational rail tunnel in the world. Japanese tunnels, such as Seikan, can be older constructions as Japan experienced economic prosperity from the 1960s onwards.

In 2006, Taiwan opened the longest underground road tunnel in Asia, it was the 5th longest in the world. The Hsuehshan Tunnel is nearly 13 kilometres long and took nearly 14 years to complete.

The next year, the Zhongnanshan tunnel bettered that by becoming the second longest road tunnel in the world, some 18 kilometres long.

While such constructions can be state of the art, the level of fire detection and suppression measures, as well as fire resistant design, can vary significantly across the region. Some countries match or exceed the standards in the west; others fall terribly short or are just starting to implement measures. Yet, whatever measures have been implemented, the risk of a major conflagration can never be fully eradicated.

The Specific Danger of Tunnel Fires

Fires in tunnels present particular dangers, more so than many open air environments.

Firstly, there are the high heat release (HHR) rates. Vehicles generate heat far more vigorously in confined spaces than open areas. The HHR can be four times as powerful in tunnels compared with open areas. Tunnel tests show that a car fire can produce 2.5 MW to 5 MW, heavy goods vehicles 20 MW to 30 MW, and tankers from 50 MW to as much as 200 MW (as illustrated by the Runehamar Tunnel tests) at the top end of the spectrum.

Then there is the dense smoke, which can be

highly poisonous and more deadly than flames.

The speed of smoke in tunnel fires can outpace those who decide to escape on foot; those that attempt to escape using their vehicles can find that smoke chokes off the oxygen to their engine, which grinds to a halt.

Roads in China are known to be among the most dangerous in the world with more than 70,000 fatalities and 300,000 injuries every year, according to the country's Public Security Ministry. With such terrible statistics, addressing fire tunnel risk is essential.

Fighting the Fires: the Challenge

When a fire takes hold in a tunnel it can present a number of specific challenges and dangers to fire fighters:

- Incredible heat that can take days to cool.
- Thick toxic fumes.
- Airflow that generates aerodynamic disturbance affecting smoke behaviour.
- Poor or no visibility.
- Confined operating space for emergency services.

We can also add the problems of communication with international tunnels: different authorities from different jurisdictions, perhaps languages, working together under pressure.

The Need for Fire Detection Measures and the Response

Tunnel designers often concentrate on the causes of accidents, which although naturally important are perhaps a distraction from concentrating on the fire detection and prevention that can help avoid lethal situations altogether. It is essential that fire detection and prevention systems reduce the risk and enable fires to be contained and extinguished before developing into unstoppable infernos.

Major incidents can generate unavoidable political pressure for a high level of tunnel safety, which can then be reflected in improved engineering standards for structural fire protection, evacuation, detection and suppression systems. As incidents are rare, the push in developing Asian Pacific countries to greater fire safety might be a slow process, until a catastrophe strikes. Even more developed countries, such as Japan, must review fire detection and prevention regularly.

Fire detection and prevention regulations and measures though are likely to evolve as an improved understanding of risks and technology improves.

Tunnel Fire Legislation in the Asia Pacific Region

April this year was the deadline for implementing the EU's 2004/54/EC directive. It mandated that road tunnels for all 28 EU member states must have fire detection monitoring for tunnels over 500 metres long, with video detection systems being mandatory for tunnels longer than 3,000 metres.

There are no global guidelines, and the Asia Pacific region does not have the political and legal integration of the EU to implement binding safety regulations. Both the International Tunnelling Association (ITA) and the World Road Association (PIARC) have published guidelines and best practices for the safe construction and operation of tunnels, but these are non-prescriptive. Research and the identification of suitable regulations continue to be pursued by The International Tunnelling Association's Committee on Operational Safety of Underground Facilities.

Countries in the Asia Pacific region vary, as do other regions, in the pursuit and implementation of regulations. Yet, whatever the legislation, neglecting adequate fire safety measures leaves the operator, local authorities and politicians open to serious disaster situations.

Fire Detection & Suppression in Practice

Many fires start with a smouldering phase. At this stage fires can be dealt with, even by non-emergency staff, contained and extinguished before disaster unfolds.

Fire detection systems need to recognise danger early. Suggested solutions that rely on heat activation alerts generally take too long – for example heat sensing cable that short circuits when the thermoplastic melts and raises the alarm. Moreover, such systems provide no visual information to help tackle the blaze. There are other systems that can be considered, such as infra-red, air sampling and other linear detection systems in addition to the above that include optic sensors.

Visual Smoke Detection (VSD) solutions are possibilities that can be considered to provide early warning. VSD uses changes in its wide field of view to alert operators, remotely or on site to potential fire danger. Possible interferences to fire detection, such as car fumes and the movement of vehicles, do not affect its effectiveness. FireVu's controlled tests at Sydney Harbour Tunnel, using a vehicle fire generating temperatures in excess of 500°C generated an alert after just 14 seconds with a further 30 alerts during the test using FireVu's VSD solution.

Let us not forget about fire suppression solutions, which can be used effectively in conjunction with fire detection solutions:

- Sprinklers, standpipes and hydrants.
- Deluge, possibly with foam.
- Water curtains – efficient at blocking flames spreading and good for compartmentalising fires, protecting tunnel structures and facilities and cooling temperatures.
- Water mist.

Passive fire prevention can minimise fire damage to infrastructure, with options ranging across micro mono-filament polypropylene fibres added to the concrete mix of wall linings, fire resistant panels and cementitious coatings. Other steps can include checking trucks before they enter the tunnel and educating tunnel users on how to deal with fire situations.

With all systems there needs to be co-operation towards finding the best solution for each tunnel from fire engineers, emergency services, government agencies, tunnel workforces, owners and other parties.

Conclusion

Fire detection and prevention are not extras but essential tools to protect tunnels and their users from catastrophe. The possible cost in lives, property loss and disruption caused means that investing fully in fire protection measures is a sound use of funds.

The Asia Pacific region's fire tunnel safety reflects the area's major period of change. Safety measures and regulations vary, but as an appreciation of the danger of tunnel fires become stronger, then the appropriate steps will be taken. Hopefully it will not take more disasters such as Yanhou Tunnel to bring fire tunnel safety to the fore. **APF**

Ali Aleali is Business Development Manager for FireVu

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Firefighting Foams Selection and Use

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Joseph Keller &
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FPA Australia

Firefighting foam is a suppression medium known for its effectiveness in preventing, extinguishing or controlling fires involving flammable liquids (Class B fuels). In recent years there has been significant discussion within the fire protection industry and related fields about the importance of mitigating potential environmental degradation caused by the discharge of firefighting foams containing fluorine. Fire Protection Association Australia (FPA Australia) recently completed and published an information bulletin entitled *The Selection & Use of Firefighting Foams* that details important factors that must be considered when selecting foam for use on fixed or portable firefighting equipment in Australia.

This article outlines the background to firefighting foams, the Association's position and considerations for the future, as detailed in the Information Bulletin.

Firefighting Foams – The Story So Far

Firefighting foam has been used in the extinguishment of fires since it was created by Russian Engineer and Chemist, Aleksandr Loran, in 1902. While water has long been understood to be the universal agent for suppressing fires, it is ineffective on some fire types such as oil fires, and can even be dangerous. For fires such as these firefighting foams represented a positive development in effective extinguishment and are still the most widely used method of combating such fires.

Firefighting foam is produced by mixing foam concentrate with water to produce foam solution. This solution can either be applied:

- **Non-aspirated:** (through water nozzles, sprinklers or deluge nozzles – provided the foam is suitable for application through these devices); or
- **Aspirated:** (when the foam solution is mixed with air through dedicated foam making devices including foam branch-pipe, top pourer, foam cannon, foam sprinkler, medium expansion pourer or high expansion generators).

The application of firefighting foams suppresses liquid fuel fires by suppressing the release of flammable vapours, separating flames from the fuel, blocking the supply of oxygen to the fuel and cooling the fuel.

Firefighting foams can be broken into two broad categories: Foams that contain fluorinated surfactants; and foams that are fluorine free.

However there are also individual foam types within these two broad categories.

Commonly used firefighting foam types are better known by the following terms:

- **Fluorinated Firefighting Foams:** AFFF (aqueous film-forming foam), FFFP (film forming fluoroprotein), AR-AFFF (alcohol-resistant aqueous film-forming foam), AR-FFFP (alcohol-resistant film-forming fluoroprotein), and FP (fluoroprotein foam).
- **Fluorine-free Firefighting Foams:** F3 (fluorine-free foams).

Fluorinated Firefighting Foams

Historically, fluorinated firefighting foams include perfluorinated and polyfluorinated chemicals (PFCs). Perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) are two of the best known PFC-based firefighting foams.

Fluorinated firefighting foams that contain PFOS and PFOA have good firefighting performance but have been identified as having a negative effect in the environment due to their chemical composition. PFOS and PFOA fluorosurfactants are manufactured by a process called electrochemical fluorination (ECF). Other fluorosurfactants can be made with a different process known as telomerisation and are known as fluorotelomers or telomer-based fluorosurfactants.

Fluorinated firefighting foams that contain fluorotelomers do not contain PFOS and only trace levels of PFOA.

● PFOS

In 2004 the first 12 persistent organic pollutants (commonly referred to as POPs) were

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listed in annexes to the Stockholm Convention. The Stockholm Convention on Persistent Organic Pollutants is an international environmental treaty (that Australia is a signatory to) that aims to eliminate or restrict the production and use of persistent organic pollutants. In 2010, PFOS was one of nine new substances added as an Annex B restricted substance in accordance with the Stockholm Convention with the expectation that every four years progress on its elimination is reported. It should be noted that Australia's National Implementation Plan for the Stockholm Convention was published by the Commonwealth Department of the Environment prior to the addition of PFOS as a POP.

Australia is yet to ratify this addition of PFOS as an Annex B restricted substance and update the National Implementation Plan to reflect this. Australia is considering ratification of PFOS as a POP but must go through a domestic treaty process that the Commonwealth Department of the Environment is responsible for. FPA Australia considers that the Australian Government should ratify PFOS as a POP in accordance with the Stockholm Convention and the Association has provided information to support this. With the goal of reducing and ultimately eliminating production and use of PFOS, the Stockholm Convention encourages:

- Phase out of use when suitable alternative substances or methods are available.
- Producers or users of PFOS to develop and implement an action plan for elimination.
- Producers or users, within their capabilities, to promote research on development of safe alternative substances to reduce human health risks and environmental implications.

The European Union (EU) has prohibited the marketing and use of PFOS since 27 June 2008 as it met the PBT criteria relating to persistence (P) and toxicity (T) and very high bioaccumulation (B) in aquatic organisms has been proven. PFOS was banned from use in 28 European countries in 2011, requiring high temperature incineration (above 1,100°C) to destroy it.

However, it is misleading and untrue to suggest that other fluorinated chemicals (produced by a different, telomerisation process producing fluorotelomer surfactants) will behave in a similar way and thus have similar negative environmental impacts.

● PFOA

While it is a substance of concern, PFOA is orders of magnitude lower in its bioaccumulation and toxic effects than PFOS. Scientific research has shown that C8 and longer chain fluorochemicals are larger more complex molecules that are more likely to breakdown to substances that become toxic, potentially bioaccumulate, and remain in mammalian organisms for longer periods of time.

PFOA is found as an unintended by-product of the fluorotelomer reaction process as trace quantities in eight carbon chain (C8) or longer fluorotelomer surfactants. In 2005, concerned about the known persistence of PFOA in the environment, detection in human blood and effects in animal studies, the US Environmental Protection Agency (EPA) and eight important

fluorotelomer manufacturers launched a voluntary PFOA Stewardship Program to phase out these small amounts of PFOA, and the precursor chemicals that can break down to PFOA, from their production processes, waste streams and finished products by the end of 2015. Most Australian distributors of foam are aligned to this stewardship program.

In 2013, the Danish Environmental Protection Agency compiled a survey of PFOS, PFOA and other perfluoroalkyl and polyfluoroalkyl substances. It confirmed that the technologically best alternatives to long-chain fluorinated chemicals are short-chain chemicals with a carbon chain length of $\leq C8$ for perfluoroalkyl carboxylates and $\leq C6$ for perfluoroalkyl sulfonates. The short-chain fluorinated alternatives are still rather persistent but much less bioaccumulative and toxic than the long-chain homologues.

By way of an example, The Danish EPA's overall conclusions confirmed that the US EPA PFOA Stewardship Program will result in significantly lower environmental concentrations and human exposure to these chemicals in the future.

The short-chain homologues have a better toxicological profile and do not bioaccumulate to the same extent as the long-chain substance as they are excreted more rapidly from both humans and organisms in the environment, but they are still persistent in the environment. The short-chain homologues and their precursors (for example, fluorotelomers based on short-chain fluorine chemistry) generally seem to have a better human health and environmental profile than the substances based on long-chain fluorine chemistry.

The French Food Safety Agency and Norwegian Institute of Public Health have evaluated the potential human health risks related to the residual presence of PFOA in non-stick coatings for cookware, concluding that the consumer health risk is negligible.

● Fluorotelomers

Scientific research into six carbon atom and shorter ($\leq C6$) chain fluorotelomer surfactants and their primary breakdown products of 6:2 fluorotelomer sulfonate (6:2 FTS) and perfluorohexanoic acid (PFHxA), have shown that although still persistent, firefighting foams containing C6 fluorotelomer surfactants are neither bioaccumulative, nor genotoxic, nor developmental toxins. They are not mutagenic, nor have they been shown to exhibit harmful effects. They have been preferentially found in aquatic sediments, are generally an order of magnitude less toxic to aquatic life than fluorine-free foam (F3) alternatives, with lower chemical oxygen demands (COD) during biodegradation. Accordingly, foam manufacturers have recently begun producing fluorinated firefighting foams containing fluorosurfactants that have only four to six carbon atoms, improving environmental properties and complying with the US EPA PFOA Stewardship Program.

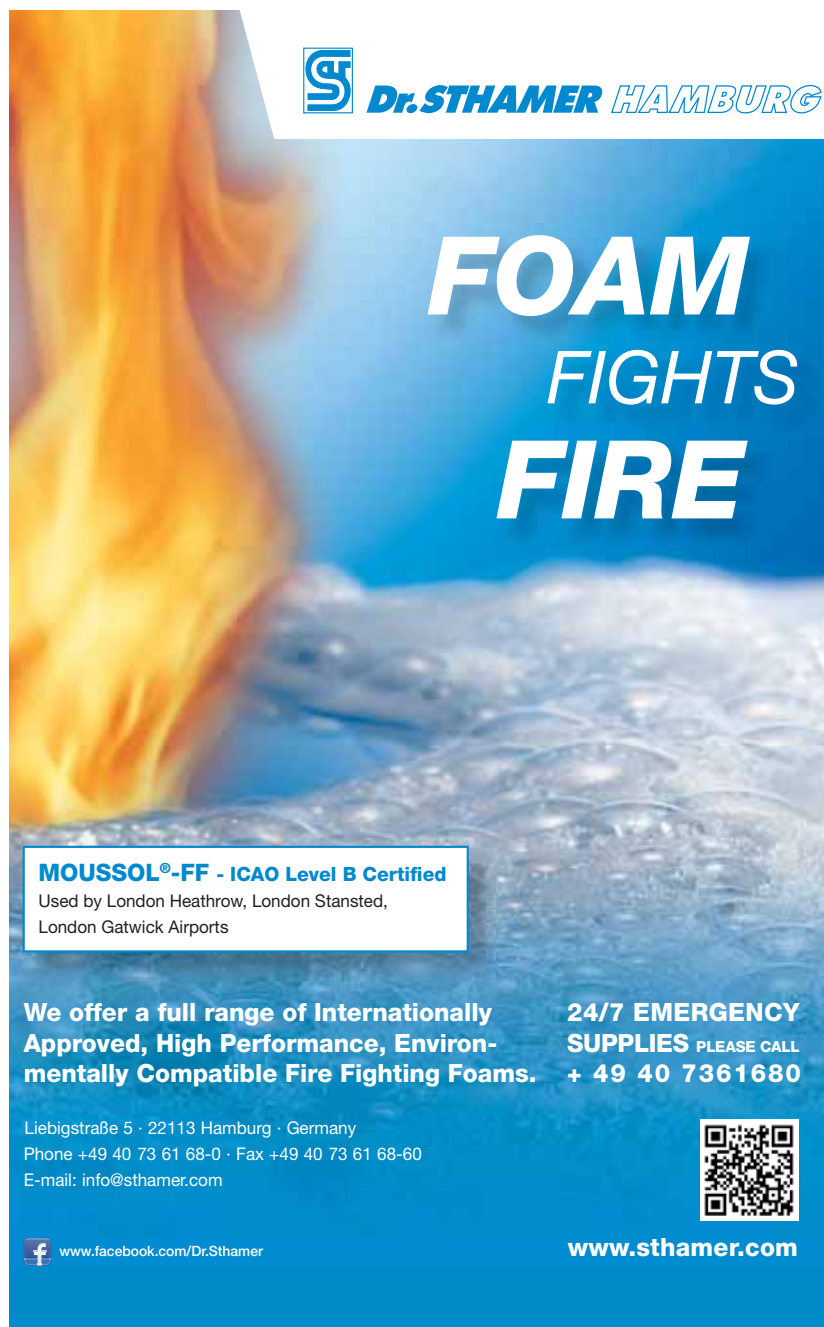
● C6 Fluorotelomer-based Foams

These foams do not break down into chemicals currently listed or suspected of being POPs and

are not listed by the Stockholm Convention or European Chemicals Agency current (2014) list of substances of very high concern (VHC). They also do not contain or break down into PFOS and are not made with PFOA or any PFOA-based products. Additionally, foams of this type are not made with chemicals currently considered to be bioaccumulative or toxic by environmental authorities. However fluorotelomer surfactant based firefighting foams still retain strong firefighting performance.

Most fluorotelomer surfactants have chemical composition, breakdown products and environmental impacts that are very different from PFOS without the far reaching bioaccumulative and toxic environmental impacts. This is evident in the shorter chain C6 fluorotelomer surfactants increasingly used in modern fluorinated foams.

Given the above information, it is clear that



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fluorinated firefighting foams should not be grouped as a single class in terms of their environmental properties. Foams containing PFOS, PFOA and fluorotelomers have distinctly different environmental characteristics and these sub-groups must be considered separately on the basis of these characteristics.

Fluorine-free Firefighting Foams

In recent years, driven by the European and US reforms, fluorine-free foam technology has advanced in order to counter concerns raised with PFOS and PFOA fluorinated foams. Fluorine-free foams are now available in the Australian and international market.

It is important to note, however, that just like fluorinated foams, not all fluorine-free foams are the same. For example, where hydrocarbon surfactants have been used to replace fluoro-surfactants, some fluorine-free foams have been shown to be an order of magnitude higher in acute aquatic toxicity than fluorotelomer-based foams.

FPA Australia supports the use of more environmentally responsible foam formulations. However, firefighting foams must only be used in applications where they provide acceptable firefighting performance and safety.

Looking to the Future – Some Recommendations

FPA Australia's recommendations on the selection and use of firefighting foam are as follows.

Based on the scientific research undertaken it is the position of FPA Australia that the use of foams containing PFOS should be banned. Additionally, the Association recommends that existing stocks of foams containing PFOS should be removed from service and sent for high temperature incineration at an approved facility.

Foam manufacturers should reduce and eliminate the production of foams containing PFOA in accordance with the US EPA PFOA Stewardship Program.

Critically, regardless of whether the foam under consideration is a fluorinated or fluorine-free foam, evidence of suitability must be provided to demonstrate its ability to achieve the required firefighting performance for the fuel in question, having been subjected to appropriate and recognised testing. Evidence of suitability must also be used to demonstrate that the foam is compatible with associated systems and equipment.

The Association takes the view that, while environmental considerations are important, the environmental performance of foam cannot be used as the sole selection criteria. In addition to

The Fire Protection Association Australia's information bulletin entitled *The Selection & Use of Firefighting Foams* was created with significant input from a range of stakeholders including major end users, foam manufacturers and the Association's own technical committees and contemporary local and international research papers.

Historically, there are a number of important applications for which fluorine-free foams have not been suitable. These include portable fire extinguishers and non-aspirated pre-engineered foam/water spray systems used to protect large mining machines.

Use of foam in these applications in Australia requires the extinguisher/system to pass specific fire test protocols detailed in Australian Standards AS/NZS 1850 (*Portable fire extinguishers – Classification, rating and performance testing*) and AS 5062 (*Fire protection for mobile and transportable equipment*) respectively. Past testing has demonstrated that fluorine-free foams have been ineffective on the fires specified in the test protocols and hence have been unsuitable for use in these applications. Regardless of the type of foam, fluorinated or fluorine-free, foams should not be used in any application unless the required fire test protocols have been successfully passed or completed.

As with fluorinated firefighting foams, fluorine-free firefighting foams should not be grouped as a single class in terms of their environmental properties or performance. High detergent content in some fluorine free foams can make them vulnerable to edge flickers, sudden flashbacks and re-involvement that can put the safety of firefighters at unnecessary risk. Some fluorine-free foams have proven firefighting performance, but just like fluorinated foams, evidence of suitability for purpose must be demonstrated.

being tested and deemed to be fit for purposes as outlined above, the Association recommends the following additional key selection criteria be considered when selecting firefighting foam:

- 1** Life safety.
- 2** Physical properties and suitability for use on known hazards.
- 3** Compatibility with system design and approvals.

Any proposal to change the type of foam used in a system requires careful consideration and must take fire safety and engineering factors into account. The type of foam used should not be changed without completing a detailed review of the design, performance and operation of the system as a whole. Such design reviews should include consultation with fire system designers, foam and foam hardware suppliers, and the relevant authority having jurisdiction.

Choosing the most responsible firefighting foam, the best one to protect people, property and the environment, involves selecting one that provides a combination of firefighting performance, reliability and life safety, balanced with minimal toxicological and environmental impacts.

APF

This article contains extracts from IB-06 Selection and Use of Firefighting Foams. To view the full document, visit www.fpaa.com.au/technical and select Technical Documents. More information is available by contacting the FPA Australia Technical Department on 1800 731 922.

Joseph Keller is Communications Manager at FPA Australia. Matthew Wright is Chief Technical Officer and Deputy CEO.

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HFC-Based Clean Agents

Sustainable Fire Protection Solutions

Since their introduction in the early 1990s, hydrofluorocarbon (HFC) based clean agents have been the most widely specified clean agents for fire protection of sensitive, valuable and mission critical equipment and assets. No other issues related to these agents are perhaps more misunderstood or misrepresented than their environmental impact and the implications of regulations on their use in fire extinguishing applications.

Environmental impact: the scientific facts.

Ozone Depletion: Since HFCs do not contain chlorine or bromine, they do not contribute to the destruction of stratospheric ozone; as a result, HFCs are not subject to the provisions of the Montreal Protocol, which pertains only to ozone depleting substances (ODSs).

Global Warming: The impact of HFCs in fire protection on global warming/ climate change is often misunderstood and misrepresented. In particular, there are several oft-encountered myths that require addressing.

Myth One

The first myth is that the emissions of HFCs in fire protection applications have a significant impact on climate change due to the GWP values of the agents

It is important to understand that the impact of a gas on climate change is a function of both the GWP of the gas and the amount of the gas emitted. For example, carbon dioxide (CO₂) has one of the lowest GWP values of all GHGs (GWP=1), yet emissions of CO₂ account for approximately 85 percent of the impact of all GHG emissions, due to the massive amounts of CO₂ released into the atmosphere from numerous sources. Clearly the GWP value by itself cannot be employed to evaluate the environmental sustainability of a particular compound. Emissions of HFCs from fire suppression applications are extremely low, hence the impact of these emissions on climate change is negligible.

Factual information related to the environmental impact of HFCs in fire protection is available from several independent sources including the US EPA and the European Environment Agency (EEA), and indicate that the contribution to global

warming of HFCs in fire protection is negligible. For example, in the U.S. the impact on global warming of HFCs in fire protection represents 0.015 percent of the impact of all greenhouse gases on global warming. For the EU-15 countries, the impact on global warming of HFCs in fire protection represents 0.05 percent of the impact of all greenhouse gases on global warming.

Myth Two

That the environmental impact of HFCs in fire protection is rapidly increasing.

Looking to the same independent sources of information, it can be seen that the contribution of HFCs in fire protection to global warming has remained essentially constant for almost a decade (Table 1). Estimates from the HFC Emissions Estimating Program (HEEP) also indicate that the impact of HFCs in fire protection is not increasing but has remained essentially steady for the past decade.

Myth Three

That HFCs in fire protection are subject to the same environmental regulations as HFCs in other applications.

It is a fact that with regard to regula-

tions, HFCs in fire suppression applications are being treated differently than HFCs employed in other applications. Emissions of HFCs from fire suppression applications are dwarfed by HFC emissions from other applications such as refrigeration. Regulatory bodies understand this, and to date HFCs in fire suppression applications have been subject to different sets of regulations. Examples include the recent regulatory decisions of the US EPA and the revised F-Gas Regulations.

US EPA Proposed Rule

On July 9, 2014 the US EPA announced proposed rules that would change the status under the Significant New Alternatives Policy (SNAP) Program of certain HFCs in mobile, stationary, foam and aerosol applications. Consistent with its science-based pragmatic approach of controlling HFC use by application, the US EPA is proposing no SNAP changes to any HFCs when employed in a fire protection application.

What does this mean? HFC-based clean agents continue to be considered sustainable fire protection solutions. In addition, no alternatives are currently available that match the overall combination of proven

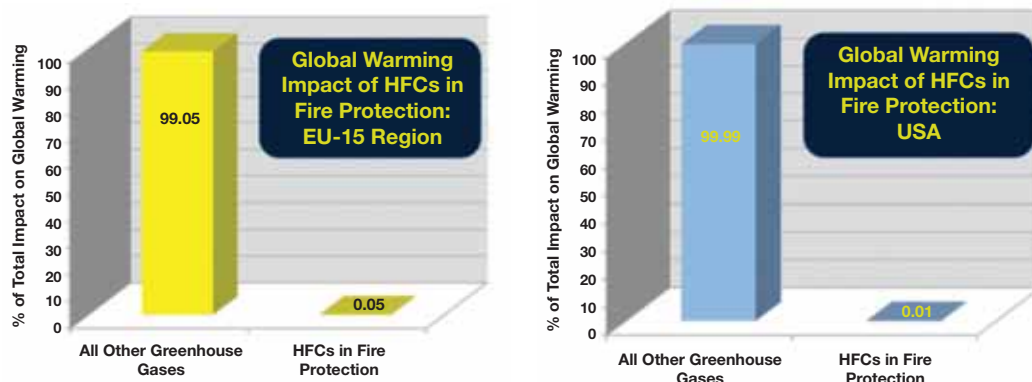


Figure 1. Impact of HFCs in Fire Protection on Global Warming (Technical Report No 09/2014, 27 May 2014, European Environment Agency; US EPA 430-R-14-003, 4/15/2014)

GASEOUS SUPPRESSION AGENTS

Table 1. Contribution of HFCs in Fire Protection to Global Warming

	Tg of Carbon Dioxide Equivalents					
	2005	2008	2009	2010	2011	2012
Refrigeration/AC	92.7	109.1	114.6	120.5	123.7	128.2
Aerosol	7.3	8.6	9.1	9.3	9.7	9.9
Foam	1.9	2.5	3.9	5.4	5.9	6.3
Solvent	1.3	1.3	1.3	1.3	1.4	1.4
Fire Protection	0.5	0.7	0.8	0.9	0.9	1.0
Semiconductor manufacture	0.2	0.2	0.1	0.2	0.2	0.2
R-22 manufacture	15.8	13.6	5.4	6.4	6.9	4.3
Total HFCs	119.7	136.0	135.2	144.0	148.7	151.3
Total All GHGs	7253.8	7118.1	6662.9	6874.7	6753.0	6525.6
Contribution to global warming from HFCs in fire protection applications	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%

performance, safety in use and cost effectiveness offered by the HFC clean agents.

European Union F-Gas II Regulation

On May 20, 2014 the European "F-Gas II Regulation" (Regulation (EU) No. 517/2014) was published. Consistent with the US EPA proposed ruling, the EU F-Gas II Regulation also recognises the value and sustainability of the HFC clean agent fire protection technologies. Since HFCs in fire protection have a negligible impact on global warming, restricting HFC use in fire protection applications would not provide any significant reduction in global warming. For this reason the F-Gas II Regulation does not call for specific restrictions on the HFCs most widely employed in fire protection (HFC-227ea, HFC-125, HFC-236fa).

The allocation scheme of the EU F-Gas II Regulation represents an overall "cap and reduction" of HFCs on a GWP-weighted basis over a specific time period – a "phase-down," not a "phase-out" of HFCs. Figure 3 depicts the effects with time

of the EU F-Gas II allocation scheme on the quantity of HFCs available for placing on the market in the EU. The HFC phase-down stipulated by the EU F-Gas II Regulation is unlikely to affect the supply of HFCs for fire protection in the EU market as fire protection represents only 1 percent of the EU HFC market on a mass basis and 3 percent of the total EU HFC market on a GWP-weighted basis [EEA Technical Report No. 15/2013].

Additional regulatory constraints on specific HFCs in refrigeration and other non-fire protection applications, along with the shrinking of the HFC refrigeration market as alternatives such as the hydro-fluoroolefins (HFOs) replace HFCs in refrigeration, will result in the further release of allowances, providing more than enough rights for HFCs used in fire protection.

The EU F-Gas II Regulation combines Articles from the orig-

inal EU F-Gas Regulation related to containment, recovery and training. As a result, the requirements of Articles 3 through 10 of the EU F-Gas II Regulation are already being complied with by the fire protection industry. Requirements related to containment including leakage prevention, repair and inspection schedule are satisfied by the existing inspection regimes established by the ISO 14520, EN 15004 or NFPA 2001 standards.

Recovery related requirements are currently being met by the numerous commercial entities already actively involved in the recovery and reclamation of HFC-based clean fire extinguishing agents. Training and certification programs for personnel involved in the handling of fluorinated GHGs have been in place for more than a decade within the fire protection sector. In summary, the requirements of Articles 3 through 10 of the F-Gas II Regulation involve activities already part of any responsible product stewardship program and impose no restrictions on the use of HFC clean agents.

Asia Pacific Region

HFC-based clean agents are currently employed throughout the entire Asia Pacific region; as a result of the July 2014 repeal by the Australian government of its carbon tax, the tax on HFCs was removed and

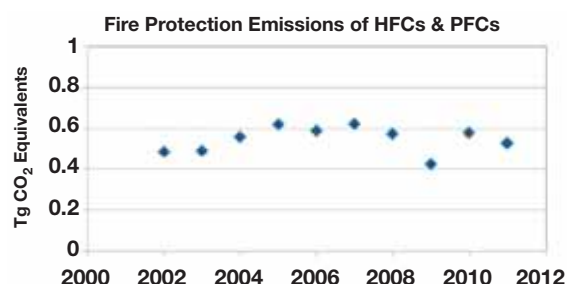


Figure 2. Impact of HFCs in Fire Protection (HEEP Final Report for 2002-2011, 2013)

Table 2. Comparison of Clean Fire Extinguishing Agents (✓ = Desired Property)

Ideal Halon Replacement	Halon 1301	HFCs	Inert Gases	Perfluoroketones
Gaseous agent	✓	✓	✓	
Low chemical reactivity	✓	✓	✓	
No effect on biological tissues	✓	✓	✓	
Electrically nonconducting	✓	✓	✓	✓
High weight efficiency	✓	✓	✓	
Low agent cost	✓	✓	✓	
High nozzle area coverage	✓	✓	✓	
Low system cost	✓	✓	✓	
Low storage volume	✓	✓		✓
Low number cylinders	✓	✓		✓
Low cylinder pressure	✓	✓		✓
Low manifold pressure	✓	✓		✓
Low enclosure pressure	✓	✓		✓
Zero ODP		✓	✓	✓
Zero GWP			✓	
Non-VOC	✓	✓	✓	

there are now no restrictions or taxes on the use of the HFC-based clean agents within the Asia Pacific region. Furthermore, there is no legislation, either current or proposed, to limit, retract or ban the use of HFCs in fire protection anywhere in the Asia Pacific region. The recent US EPA decisions apply only to the United States and the EU F-Gas II Regulation applies only to the member states of the EU, and has no effect on the use of HFCs in the Asia Pacific region.

Importantly, these recent regulatory decisions are based on sound science and recognise the value and non-emissivity of HFC clean agents in fire suppression. Regulators outside of the USA or the EU, when empowered with the facts, are likely to reach similar conclusions: (1) the use of HFCs in fire protection has negligible impact on global warming, and (2) reducing HFC emissions from fire protection applications does not provide any significant reduction in global warming, and increases the risk of fire and loss to people and property.

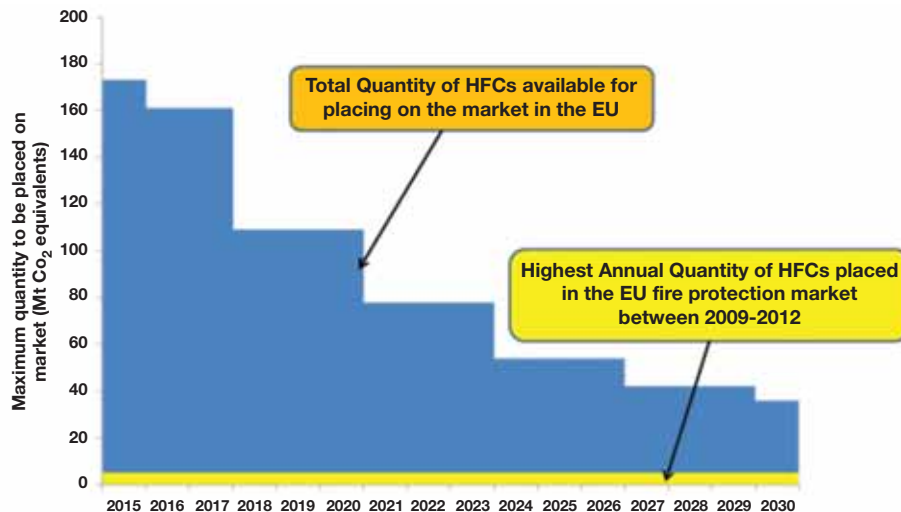


Figure 3. European F-Gas Allocation Scheme: maximum quantity of HFC allowed to be placed on market

Conclusion

The emissions of HFCs in fire protection are extremely low, hence their impact on global warming is negligible. As a result, restricting HFC use in fire protection applications would not provide any significant reduction in global warming and efforts beneficial to the environment are more productively focused on other sectors with much larger impacts. Regulators clearly understand this and HFCs in fire protection

are being treated differently than HFCs in other more emissive applications, as evidenced by the recent regulatory decisions of the US EPA and the revised F-Gas II Regulation.

To date no product or technology has been found which satisfies all of the criteria of the ideal Halon 1301 replacement. Each class of clean fire extinguishing agent (HFCs, inert gases and perfluoroketones) has strengths and weaknesses, and clean

agent selection must be based on the physical and chemical characteristics of the agent along with detailed knowledge of the specific project requirements. As seen from Table 2, no agent satisfies all of the requirements of the ideal Halon replacement; however, Table 2 shows that the HFC-based clean fire extinguishing agents provide the best overall combination of the desired properties.

The recent regulatory decisions of the US EPA and the EEA are based on sound science and recognise the value, importance, and non-emissivity of HFC clean agents in fire protection, and as regulators outside of the USA or the EU are empowered with the facts, they too are likely to reach similar conclusions: the environmental impact of HFCs in fire protection is negligible and the HFC based clean agents are viable and sustainable fire protection choices for the foreseeable future.

With the recent major regulatory decisions in the USA and Europe, 2014 marks the year in which the sustainability of HFCs in fire protection has been established. **APF**

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Social Media in Today's Emergency Service

It is not all about tweeting!

If you tweet in the forest and no one is following you, does it make an impact? Or is it a real Tweet? Social media, smart phones, "connected generation" and many more descriptions are thrown around in the emergency service network nowadays. But flooding a community with too much information may cause confusion.



Neil Bibby

Before you say what does this grey haired old bloke know? Let me give you a background; I have observed and supported the rise and rise of social media in our industry; I currently have three Twitter sites and two Facebook sites; I administer two web sites and I work with a USA firm on social media monitoring software. On top of all that I have just released an app designed to allow emergency service workers to log their careers, the incidents they attend, the training they do and their service record (www.Impactlog.net). So yep, I play in this world. It is not just the young that have embraced social media!

At the last count in Australia, there were 95 formal twitter sites dealing with warnings and information, at least 62 Facebook sites from agencies and hundreds, if not thousands of peripheral sites from the local brigade/unit and individuals posting, as well as those blogging about anything and everything. For example: NSW Rural Fire Service (@NSWRFS); NSW Police (@nswpolice); Victorian Police (@VictoriaPolice); Queensland

Police (@QPSmedia); Western Australia Police (@WA_Police); South Australian Police (@SAPolice-News); Australian Government's travel advisory (@smartraveller); the Department of Health (@healthgovau); Fire & Rescue NSW (@FRNSW); Country Fire Service South Australia (@CFSAlerts); the City of Brisbane (@brisbanecityqld); City of Sydney (@CityofSydney); the Australian Red Cross (@RedCrossAU); and private providers (@couldyoucope).

There is no doubt that information is power and therefore the more information we give out the more empowered the community we protect feel and are. However, flooding a community with too much information may cause confusion. Let us look at the world of twitter and Facebook, as they are still the most popular at this time.

Social media statistics Australia-June 2014 report estimates that there are over 2.5million active Australian users of Twitter that is about 10.5 percent of Australia's population. If I take out the 0 to nine-year-olds (2.8 million) and the

SOCIAL MEDIA IN EMERGENCIES

70-plus-year-olds (two million), as they have the lowest take up of Twitter, we still only get to 13.3 percent. If I do the same sums for Facebook I get a very different profile. Facebook has 13.2 million users, which is a massive 70 percent of the population aged between nine and 70. Apologies to the over 70s Facebook users of which, anecdotally, there are many but data is scarce.

On these figures you would think that you would be able to warn the community of a pending disaster, and this is the simplistic approach taken by many that are not involved with the detail of social media. "I have tweeted and put a posting on Facebook now the community is informed!"

But there are problems with this approach:

- 1 Active Twitter users could be following between 500 and 2000 fellow twitterers, which means a constant stream of tweets coming through their smart phone all day and all night; an emergency tweet would stay on the first page for approximately 30 seconds. Even a tweet with an emergency alert will get over run in a very short time. The problem is that you cannot expect a tweet to be seen in a timely manner.
- 2 Those that are following less than 500 are not active twitter users and only look in occasionally. You cannot expect a tweet to be seen in a timely manner.
- 3 To continually monitor a Twitter site such as @CFSAlerts is not practical. What are the cues that will alert someone to be continually on line?

4 Facebook has a far greater penetration but the usual application for a Facebook user is to interact with family and friends. Unless you have set up the site to monitor alerts in a particular neighbourhood you will be oblivious to what is going on. How do you get people to set their page up for alerts?

5 Facebook is not the type of media that is watched on a continual basis by most users. Although there are 13 million users they mostly dip in and out during the day, which creates the same problems as above.

So when I see agencies saying they have put out hundreds of warnings I wonder: who is listening? Hence my opening sentence.

Do not get me wrong, I think these are fantastic tools and should be embraced by emergency services, and many agencies are setting up social media units, which is great to see.

My perception is that the infrastructure and effort is going into getting clear and concise timely messages out to the public. Fantastic first stage and, most if not all agencies are doing a great job in this field. Now let us concentrate on getting people to listen, and listen at the right time. After many years in disaster preparedness it never ceases to amaze me when, after the event, people say "no one told us it (the disaster) was coming".

The first issue is that we do not really know the actual number of people that are using social media effectively in a disaster or pending disaster; I could only find raw numbers of users in generic

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categories. We need base figures to start measuring how we are improving.

The second issue is how the general public use social media by various demographic groups so we can systematically target, instead of using the shot-gun approach and hoping to hit the spot.

The third is the opposite of push marketing (pushing out information). It is how we get the general public to pull information from the many sources they have at their disposal, in a timely manner. This push/pull process is critical for quality communication.

Last of all, the general public is receiving vital information on the ground before, during and after a disaster, and agencies should be using social media to collect this data for operational intelligence.

The first issue is not easily solved without a considerable research project and we do not only want to gather data on what is happening now, we also need a cost effective methodology to continually monitor. The Bushfire and Natural Hazards CRC has two research clusters, "Communication and Warnings" as well as "Understanding and Measuring Social Resilience". I hope that this base information will come from this research. Unfortunately this will be some time down the track and we cannot wait before the other issues are addressed.

Secondly, for targeted information, it is time to call in the experts. We have many well-intentioned people in the emergency services and there are a number of well-qualified social media experts but this does not measure up to the hundreds of people worldwide getting and building tools for large firms. The large marketing (not PR) firms stake their reputation on being up-to-date and having the best available research, on the best way to get messages across to separate market segments and, more importantly, on how to make them act (buy) on that information.

This will be an expensive exercise (if it is not, then you have a second tier firm) and should be shared by a number of agencies, for example, a cluster of police agencies and/or fire agencies. The old way of everyone doing their own thing must be put aside because this is bigger than each and a benefit to all. I would like to think that industry and/or national bodies could organise this vital bit of marketing advice. Note that I did not call this research, because the research has been done for other markets; we are just using what the rest of the world uses.

The push/pull process may be refined by actions in the earlier paragraph. There has to be an acknowledgment that it is not about how many tweets you can send out, or how up-to-date/accurate the information is. I think this is recog-

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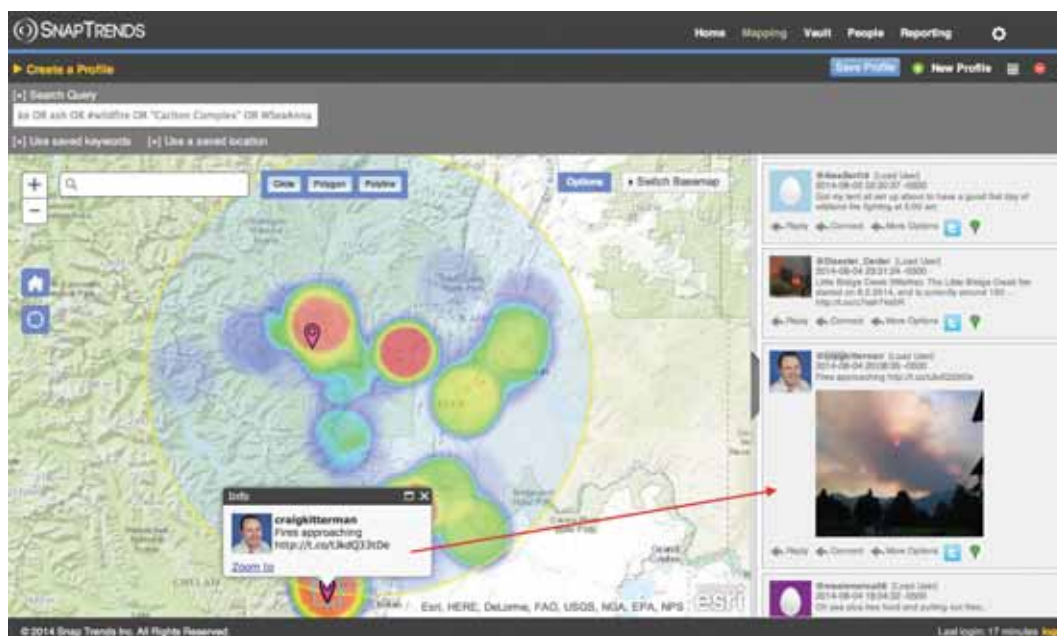


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nised but, at the end of the day, we still report on how fast the information got out and how often it was sent, as well as how many different types of media was used.

So pushing we are good at, unfortunately the public is not as enthusiastic about pulling in information, so we have to help them, and we are. With the ability to personalise messages now – for example see this FEMA site (twitter.com/FEMA/alerts) – we can assist the public to set up their devices to pull out the information that is relevant to the individual and his or her location.

The use of technology is not the only way this will happen; the public needs its hand held on how to set up their social media site. How often do we say “you can get information on Facebook” but we do not tell them that liking the site will give them direct information.

Then there are the features on social media that are imbedded in the settings or functions that are not normally used. Think, do you know how to set up a private Twitter list with your priority emergency information tweets? Do you know how to turn on the ‘tweet to my mobile phone’ feature? These two simple functions, if used by a member of the community we protect, allows them to pull information at a critical time and does not rely on them being on line when the warning comes through. This is the job of a social media department; find the features and educate the general public. Most users are only using a small proportion of the social software’s full functionality.

Then there is the use of social media by agencies to gain information instead of sending out information. During any activity on the streets today, whether it be a cute dog doing tricks, a racial rant in a bus or an earthquake, the first thing people do is get out their smart phone and start taking photos – unfortunately often before they call the emergency line. I do not have to tell you how important this information is to police and emergency services.

A photo of the early stages of a burning building will inform as to what equipment to send, where the fire started and the people on scene at that early stage, which may help police with arson

inquiries. It can show direction and intensify of forest fires, how well communities are physically and physiologically prepared. You could even monitor the community’s attitude after a community meeting pre and post the fire. Helping to understand the community feeling during recovery may assist in greatly in dealing with their actual problem, instead of the perceived problem.

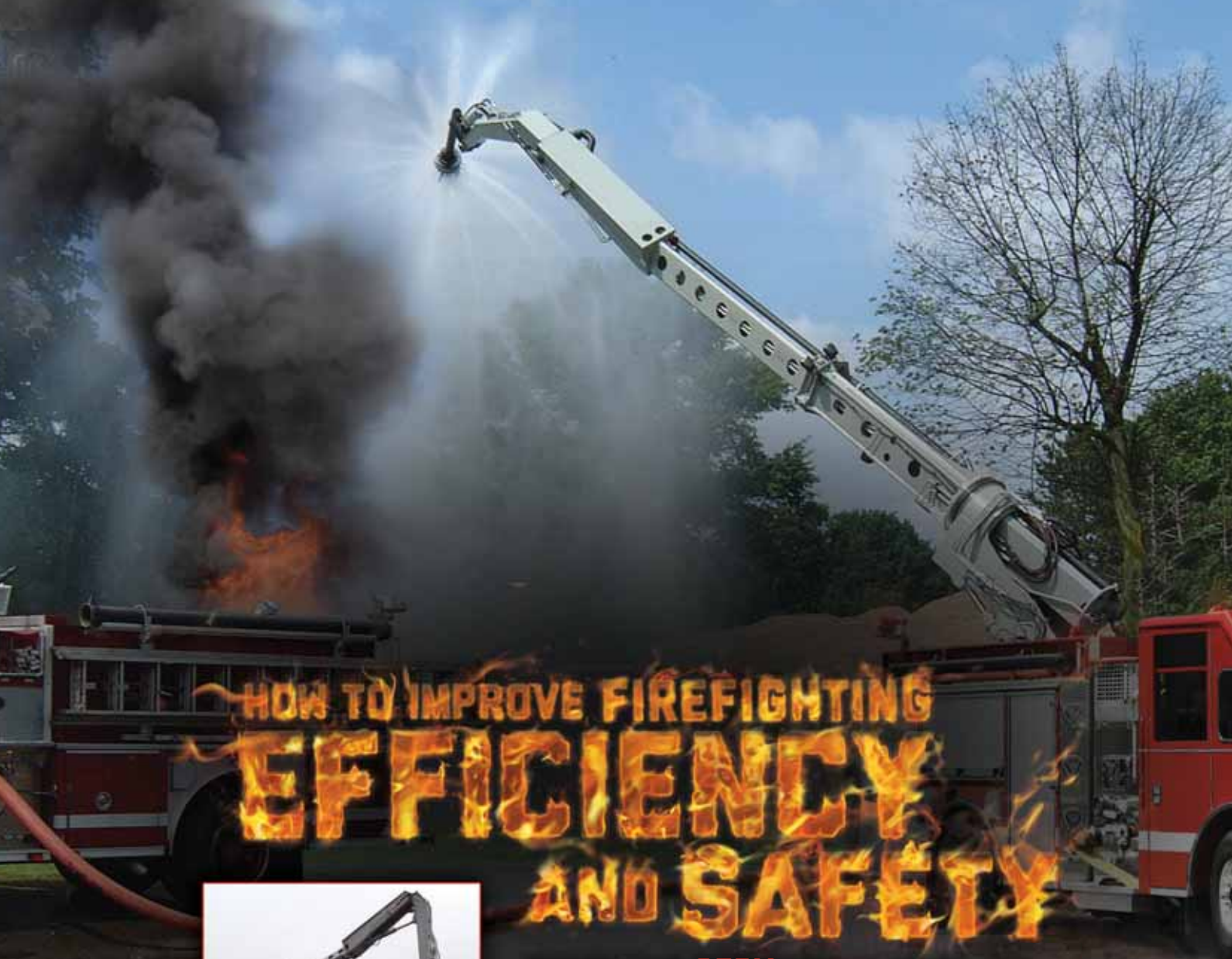
You will not do this with the traditional methods of listening to messages that are directed to you, the clutter will get in the way of quality information. Also they might not direct a complaint to you at all, but instead discuss it among their friends. Social media is a very public way of communicating whether it is photos or saying what you think. Large corporations use sophisticated software to scan all media for market information, not only that directed at them. The software is so clever it can suck social media from geographical areas ranging in size from a football ground to an entire country; it can analyse it in real time, pull out key words and display all photos taken while geo-location the exact location the photo was taken from. This software is now at a stage that agencies cannot afford not to have it. There are a number on the market, have a look at www.snaptrends.com to get a feel for what is available.

In summary, we have looked at the power of social media, and how it is now fully integrated in our day to day life. This adds to the public’s perception that they will get timely and accurate information when and where they want it. We have looked at the problems and some solutions as well as additional benefits that can be gained from this powerful tool. The underlying issue is that we are still on a steep learning curve and only just realising how truly powerful this not-so-new media is.

I have been asked to do a regular section in *Asia Pacific Fire* comparing different social media software programs, in particular comparing Apps that have been designed to assist in emergencies in order to show current best practice. Should you have any suggestions it would be appreciated. Feel free to contact me on neil@people-innovation.biz. **APF**

Neil Bibby was Chief Executive Officer of the Country Fire Authority between 2002 and 2009 and Managing Director People and Innovation

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Water release pressure	MPa	1.2	1.2	1.2	1.2
Water intake depth	M	60	15	15	15
Vehicle dimensions	M(L×W×H)	8.0×2.5×3.5	12.0×2.5×3.5	12.0×2.5×3.5	12.0×2.5×3.5
Vehicle weight	Kg	15,000	22,000	24,000	25,000

● (F) includes foam mixer (option) * HS150 is a container model.

■Hose Carrier (with detachable hose container)

Hose Recovery Unit Model		HRU200 (for 150 ~ 200MM hose diameters)	HRU300 (for 250 ~ 300MM hose diameters)
Hose load	M	1,000 ~ 1,800M	400 ~ 600M
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Vehicle weight (hose not included)	Kg	12,100	14,300



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A large mobile ventilation unit can be used to rapidly ventilate even the highest multi-storey structures. Picture Courtesy of Tempest Technology Corporation



Defensive Use of PPV in Complex Structures



Arturo Arnalich

CEIS Guadalajara

The right tactical approach when using PPV (Positive Pressure Ventilation) can be both life-saving and extremely safe in complex building fire environments.

When dealing with a fire in a complex structure such as a multi-tenant high-rise building, on arrival development of the fire is usually limited to a single apartment. However, in most cases the common stairwell within the structure is rapidly filled with heavy smoke, originating from the seat of the fire and spreading to the upper levels. This places occupants attempting to escape the building via the stairwell at tremendous risk.

We are then immediately confronted with a simple yet serious question: what should be done first? Deal with the fire, or take care of the potential victims inside?

When it comes to simple structures, making a fast push towards the seat of fire maybe an option, but in complex structures putting the fire out might be too time consuming. Something has to be done for the victims first.

Two approaches are possible:

- **Remove the victim or victims from the hazard:** This is the traditional approach used by interior crews assigned to search and rescue. In this case, crews must deal with low visibility,

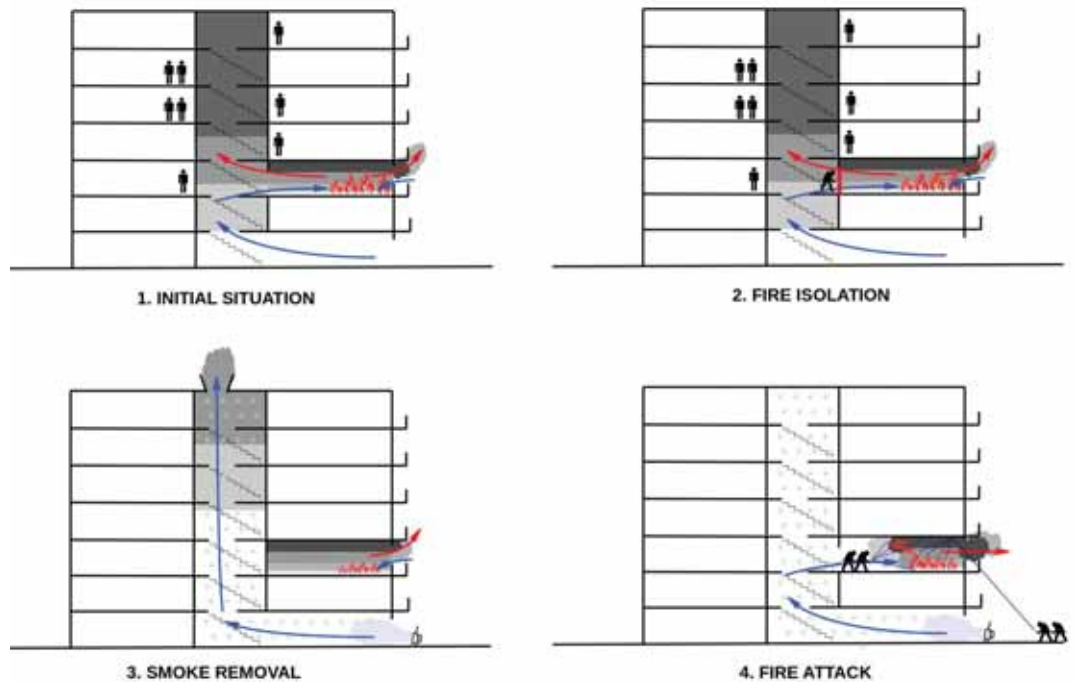
high temperature and toxic interior conditions. If multiple victims are involved, which is to be expected in multi-tenant buildings, completing this task within the survivability time range of the occupants can be extremely difficult.

- **Remove hazard from the victim or victims:** Removing the smoke from non-fire areas, such as the stairwell and unaffected apartments, will provide tenable conditions for trapped victims outside the fire area. This creates a clear egress path for occupants and safer interior conditions for firefighter progression. Positive pressure ventilation (PPV), along with fire isolation techniques or smoke curtain devices, is a highly effective means of removing smoke from enclosure structures.

A “remove hazard from the victim” tactical approach is most useful in fire incidents with multiple victims involved, complex structures or fire departments short on staffing. In several European countries (Germany, the UK, Spain and others), the defensive use of PPV is a widespread, well proven and successful life-saving tactic.

The main objective of this tactic is to be able to

Operation evolution



break a complicated fire scene into two less daunting incidents. The “divide and rule (or conquer)” – “*Divide et impera*” – Julius Caesar, Roman Emperor, 1st Century, BC – applied to the fire ground creates two different fire scenes within the same incident:

- **Scene A:** Fire area. Generally one apartment involved upon arrival.
- **Scene B:** Smoke filled areas not directly affected by the fire, such as the stairwell and other apartments in the structure.

In order to divide the incident, we need to isolate the fire area from the rest of the building and use PPV to create airflow in the desired non-fire area contaminated with smoke. Since the fire room will not be supplied with fresh air from PPV operations, there is no risk of additional fire development. With that being said, this can be considered a conservative and extremely safe ventilation tactic, even among the strongest opponents of positive pressure.

If desired, PPV can be used to create airflow through the seat of fire (termed “offensive PPV” in Europe and “positive pressure attack” (PPA) in North America). Doing so can be tremendously helpful in improving interior conditions and victim tenability. Nevertheless, airflow through the seat of a fire will create a significant increase in the heat release rate (HRR) of a ventilation controlled fire (VCF), thus requiring perfect coordination and timing with water application on the seat of fire.

A Defensive PPV operation evolution takes place in five steps:

- 1 Isolate the fire.
- 2 Create an opening.
- 3 Remove smoke using PPV.
- 4 Close opening to increase interior pressure.
- 5 Fire suppression.

Step 1 will divide the problem (fire area from non-fire area). Steps 2, 3 and 4 take place in the non-fire area filled with smoke. Step 5 takes place in the fire area.

Although sufficiently staffed fire departments may be able to deal with the two problems

simultaneously, the most common approach is to remove smoke from stairwell from the non-fire area first, and then proceed to fire suppression.

1. Isolating the Fire

Unfortunately, many occupants exit their apartment leaving the door opened to the corridor or stairwell. This allows smoke to spread throughout the common corridor, stairwell and any other open spaces. In other cases, poor quality fire resistant doors may be damaged during fire evolution, allowing fire gases to creep into the stairwell.

Isolating the fire can be done from a very early stage. The crew commander assigned to recognise interior conditions may simply close the door to the apartment on fire. In addition, wetting the door as soon as water is available will improve its fire resistant capabilities.

The use of a smoke curtain device can also provide a solution whenever the door is damaged, and help to prevent smoke from leaking into the stairwell once the involved apartment is accessed for fire suppression (Step 5).

During initial inspection of the fire area, fire conditions and victim tenability are assessed. A fast search and rescue operation can be carried out in some cases, but a fully involved fire with poor victim tenability requires the focus of available resources towards the remaining smoke filled part of the building.

2. Creating an Opening

In order to create a unidirectional airflow through the building, both an inlet and an exhaust are needed. The main entrance to the building is – usually used as the inlet. Due to the buoyancy effect of smoke, higher temperatures mean lower density, thus forcing the smoke to “float” over heavier fluids (cool air). With this being said, the exhaust should be placed at the highest position possible to ensure complete and efficient smoke removal.

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exhaust point is by interior progression up the stairwell to open ventilation devices placed at the top. Exterior access with the use of an aerial vehicle or different stairwell to gain entry to the roof may be necessary when heavy smoke and extreme temperature conditions are encountered.

Having an exhaust point which may be easily closed or resealed is always most desirable. Therefore, a force opening is a better option than a break opening. Being able to reclose the exhaust point is important for a number of reasons; the operation may need to be aborted, a different airflow may be required and once the smoke has been removed from the stairwell, resealing the exhaust point will help to increase interior pressure.

A one square metre exhaust size can be enough to perform a defensive PPV operation although better results are achieved in the two square metres to four square metres range. While offen-



Firefighters using a smoke curtain device to isolate fire from stairwell.

Picture courtesy of Dr. Michael Reick

sive PPV (PPA) requires very fast smoke removal in order to minimise the increase in heat release, this parameter is not as critical in defensive PPV since the smoke in stairwells is colder and less likely to reach its ignition point.

Some buildings do not have ventilation openings in the stairwell. In such a case, smoke must be carried out through one of the apartments on the uppermost floor. Property damage should be expected, but should not be a concern when considering the hazard of a smoke filled egress path.

3. Removing Smoke

It is strongly recommended that crews return from the fire floor and exit the structure before starting ventilation to avoid being exposed to smoke flow. Otherwise, if a door is to fail or an accidental opening is created, crews may be positioned directly in the flow path of hot fire gases.

In a general setup, a unidirectional airflow is created from the entrance door (where a positive pressure ventilation fan is placed) leading to the exhaust opening in the upper portion of the building. The setback distance between the fan and entrance varies upon inlet size and fan performance, ranging from two metres to four metres for a typical two-metre by one-metre building entrance door.

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Most fans used today are rated around 30,000 cubic metres an hour. At 50 percent of this rated capacity, a five-metre by two-and-a-half-metre plan and a 20-metre high stairwell can be cleared out in one minute if no additional smoke is drawn into the stairwell.

4. Closing the Exhaust

Once the smoke is removed from the stairwell, closing the exhaust point, while continuing to conduct positive pressure ventilation, will create a differential pressure between the stairwell and



Fan placed at an entrance of a high-rise building. Picture courtesy of Tempest Technology Corporation

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A typical "V" shape PPV fan setup.
Picture courtesy of Kriss Garcia



exterior. There are several advantages to this positive pressure differential:

- Prevents smoke flowing back into the stairwell. A smoke curtain blocking the upper part of the door to the involved room will improve the result.
- Reduces the chances of fire spread and propagation. The differential pressure will create airflow against the fire room at the opening; therefore, fire propagation is less likely to happen.

the structure. Transitional attack does not require a full interior team, so it can be performed by a backup team working the exterior.

- **Indirect Attack:** Conducted from the apartment door or outside window to fill the fire area with steam for fire suppression.
- **Interior Progression by Attack Team:** An attack done while keeping the door closed (or a smoke curtain in place) to avoid smoke spreading into the stairwell.

Positive Pressure Ventilation can clear smoke rapidly from stairwells and smoke filled areas to provide a safe path of egress.

Suppression can begin as soon as the fire is isolated and can be conducted while the PPV operations are taking place.

5. Fire Suppression

Although numbered as Step 5, fire suppression can start as soon as the fire is isolated and enough staff are on the scene. A second due crew can start fire attack while the first due crew is still performing defensive PPV. If only one operation can be conducted at a time (due to short staffing or no mutual aid) interior attack for fire suppression should begin only after the smoke has been cleared out of the structure.

There are a number of tactical choices to be considered in the fire attack:

- **Transitional Attack:** An offensive exterior attack using a straight stream aimed to the room ceiling has proven to be an effective way to "reset the fire" and increase victim survivability by reducing temperatures throughout

Conclusion

In complex structures (high-rise, multi-tenant), isolating the fire area from the rest of the building divides a fire operation into two, less complex, incidents where different tactical approaches can then take place.

Removing the hazard (smoke) from the victim or victims is more effective and efficient than performing a search and rescue operation (remove the victim or victims from the hazard) in complex structures.

Positive Pressure Ventilation (PPV) can rapidly clear smoke from stairwells and smoke filled areas to provide a safe path of egress.

Suppression can begin as soon as the fire is isolated and be conducted while the PPV operations are taking place.

APF

Arturo Arnalich is a Battalion Chief in the Madrid metro area for CEIS Guadalajara, responsible for the Operational Division. He is a member of Underwriters Technical Panel for the PPV study

For further information, go to www.artarnalich.wordpress.com or www.tempest.us.com

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Chris Miles

UL

Over the past two decades, the ANSI/UL 1709 (Rapid Rise Fire Tests of Protection Materials for Structural Steel) test standard has grown in importance across the worldwide petrochemical industry for the hydrocarbon fire protection of structural steel. The standard is currently considered the 'default' standard in many parts of the world, particularly those which actively use guidance for the petrochemical industry published by the American Petroleum Institute (API).

However, legislation and guidance in many parts of the world impose additional requirements on the products that the current UL 1709 test method cannot fully encompass. In order to ensure that UL certification remains relevant to the needs of the industry, UL has undertaken a review of the industry needs and developed a new certification category that includes a wider suite of characteristics for steelwork protection when used in petrochemical type

installations. These characteristics will be collated into a certification program as a new UL service provision.

Mandatory Characteristics

The UL program for the protection of steelwork exposed to fires burning hydrocarbon fuels – such as those found in petrochemical installations – will be based upon the product complying with UL 1709 as a mandatory minimum.



Fire Exposure

As might be expected for evaluation of products in installations such as those processing hydrocarbon fuels, the test method uses a higher heat and energy than a fire condition based on a 'standard' building fire, which uses a cellulosic fuel source as reflected in ANSI/UL 263 (ASTM E119) (*Fire Tests of Building Construction and Materials*). Therefore the new certification category will be based upon a mandatory requirement of satisfying UL 1709 as a minimum.

UL 1709 was developed specifically to evaluate products subjected to hydrocarbon fires and is

environmental factors. This is particularly important if the products are to provide a life safety function such as fire protective materials.

The new Hydrocarbon Category will therefore also include evaluation of the protective coating against the long-term effects of environmental exposure, often a critical factor in the performance of materials in petrochemical installations.

The method is already a mandatory part of UL 1709 and will also be a requirement of UL's new Hydrocarbon Category. In time, these environmental requirements will transition to include a requirement to comply with the development of UL 2431 (*Durability of Spray-Applied Fire Resistive Materials*).

Optional, Additional Characteristics

In addition to the requirement for UL 1709, the scheme will allow for optional characteristics to be included within the product's claim of performance. These characteristics are aspects of protection that are often required of the product when

installed in installations such as petrochemical facilities. Mandatory and optional characteristics, which have been complied with, will all be included within the scope of the certification.

Jet Fire

Due to the pressurised nature of the hydrocarbon fuels within the pipes and vessels within the facility, fires can be of a very fierce nature, even above the temperatures and ferocity of those specified in UL 1709. For this reason an International Standard, ISO 22899 (*Determination of the resistance to jet*

ANSI/UL 1709 has grown in importance in the petrochemical industry for the hydrocarbon fire protection of structural steel. It is currently considered the 'default' standard around the world.

widely accepted as the means of evaluating steelwork protection in many regions internationally. For this reason, and without wanting to add a new requirement, UL 1709 will form the basis of UL's new Hydrocarbon Category.

Environmental Exposure

Petrochemical type installations are obviously built to exploit the presence of underground natural resources and/or to provide a strategically located onward transport facility for the refined products. Additionally the industrial nature of the facilities can result in a corrosive atmosphere for the building infrastructure.

This can, and often does, mean that the facilities are placed in more challenging natural environments such as those that suffer extreme heat and cold or at the edge of oceans that, literally by their very nature, means the products used for the buildings need to be stable when exposed to these

fires of passive fire protection materials – Part 1: General requirements – First Edition) has been developed to evaluate protective materials against the temperature and erosive nature of fire emanating from pressurised hydrocarbon-carrying pipes and vessels. These fires, colloquially known as 'jet-fires', have become increasingly specified in the petrochemical industry and, after discussion with stakeholders, UL believes there is much value in including this optional characteristic within this certification category.

Multi-Temperature Analysis

The hydrocarbon certification category also includes product design tables for alternate critical core design temperatures. This is achieved by conducting an evaluation of the test data called the Multi-Temperature Analysis (MTA).

The purpose of this analysis is to identify the thickness of coating material necessary to keep a

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STEELWORK FIRE PROTECTION



specific substrate below a specific temperature for a specific duration. This philosophy is in line with the philosophy and criteria of UL 263 and UL 1709, but does not restrict the limiting steel temperatures to 593°C/704°C and 538°C/649°C for beams and columns respectively.

The information relating to multi-temperatures is often used in performance-based fire protection applications where a specific fire protection solu-

tion will require a specific level of fire protection due to the different heat exposure generated from the anticipated fuel source. In order to accommodate this, alternate critical core temperature designs for the products have been developed at various temperatures ranging from 371°C to 760°C in increments of 38°C. The ability to have the data analysed using the MTA method will be included as an option within the category.



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Fire Exposure

Products certified under this certification may also be exposed to additional fire exposure conditions. The standards for such elective fire exposures will include BS 476: Part 20: Annex D.

In some specifications, often for separating bulkheads and decks, the test method referenced in Annex D of BS 476 (*Fire Tests on Building Materials and Structures – Part 20: Method for Determination of the Fire Resistance of Elements of Construction*) is specified as the temperature exposure. Therefore the new certification category will allow for testing to this standard and on these types of constructions as an optional additional characteristic.

UL 1709 was developed specifically to evaluate products subjected to hydrocarbon fires. It is widely accepted as the means of evaluating steelwork protection in many regions internationally.

Environmental Durability

In addition to the mandatory minimum environmental evaluation that is included as part of the UL 1709 evaluation, the scheme will allow for additional evaluation via Norsok M-501 (*Surface preparation and protective coating*) Revision 5 test method. This evaluation method is increasingly used in the petrochemical industry to evaluate the protective properties of materials and UL has, accordingly, included this testing as an optional characteristic.

Final Certification

The end result will be a certification coverage that will address the mandatory minimum of UL 1709 and environmental exposure, but can also include other characteristics that the product may have been tested and evaluated against. The resulting scope of certification will be 'listed' on UL's Online Certifications Database viewable publicly via www.ul.com.

This will enable the products that have certification against this category to be compared side-by-side and their scope of performance to be judged on an even basis. Certification to this category will also provide the end user with reassurance that the performances shown in the certification are evaluated independently by UL, a reputable third-party certification body, indicating that the product is made under regularly inspected factory production controls leading to a consistently manufactured product.

APF

Chris Miles is Business Manager, Built Environment Division – Europe & Latin America at UL and Head of UK EU Notified Body for Construction Products

For further information, go to <http://industries.ul.com/building-materials/fire-resistive-products/>

PURE AIR UNDER PRESSURE

MCH-6/EM
 DRIVEN BY:
 SINGLE-PHASE ELECTRIC MOTOR
 CHARGING RATE:
 100 L/min 6 m³/h
 DIMENSIONS:
 HEIGHT 35 cm
 WIDTH 65 cm
 DEPTH 39 cm
 DRY WEIGHT: 39,5 Kg

MCH 16 ET COMPACT
 DRIVEN BY:
 THREE-PHASE ELECTRIC MOTOR
 CHARGING RATE:
 265 L/min 16 m³/h
 DIMENSIONS:
 HEIGHT 88 cm
 WIDTH 92 cm
 DEPTH 61 cm
 DRY WEIGHT: 187 Kg

MCH 16 ET STANDARD
 DRIVEN BY:
 THREE-PHASE ELECTRIC MOTOR
 CHARGING RATE:
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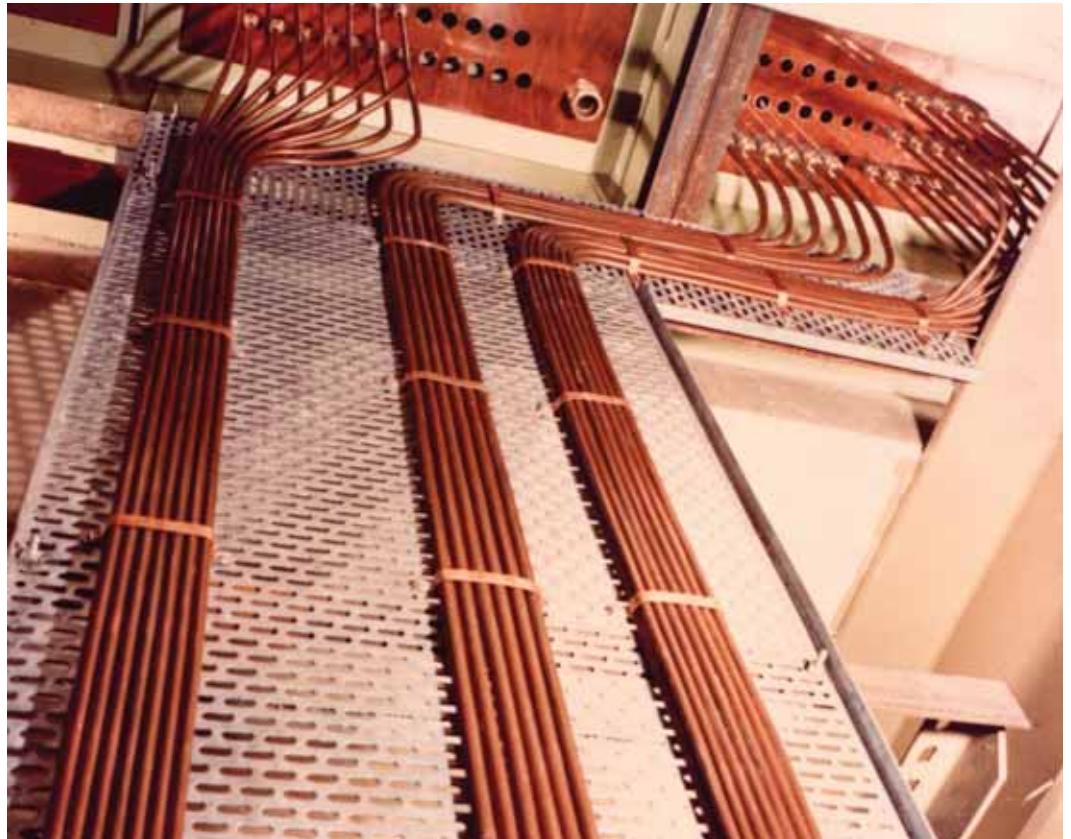
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Fire performance of Electric Cables



Richard Hosier

Electrical cables are frequently blamed by the media and fire authorities as the cause of building fires however it is often not the failure of the cable which starts a fire but the misuse of the cable by frayed or damaged insulation, overloading due to incorrect or insufficient circuit protection, short circuit or over voltage. These situations can cause high temperatures in the cable conductors or electrical arcing which may heat the cable insulation and any surrounding combustible materials to start a fire.

Cable manufacturers generally endeavour to manufacture electric cables which under the above situations, or in cases where a fire is started by another unrelated cause, will not burn or at least will not help spread a fire through the building.

Today there are various cable flame retardance test standards written by technical standards committees in Europe and USA. These common standards propose test methods intended to determine if the electric cables or materials they are made from are self-extinguishing (Flame Retardant). These test methods may also be embedded by Authorities into mandatory building design codes.

This article takes a look at the common test methods and questions if the test protocols employed do in fact provide the implied level of flame retardance performance when cables are installed and used in buildings.

Making flexible electric cables

Most common flexible cables are made from hydro-carbon based polymers. These base polymers are not usually flame retardant and have a high calorific value so chemicals are added to make them more suited to electrical cable use. Halogens like Chlorine are particularly good additives which help retard flame propagation and don't significantly impact the dielectric properties of the polymer so Halogens can be used in both cable insulations and in cable sheaths. These halogenated polymers (example: PVC & CSP) also have a negative side effect that in fire they can release the halogens which are extremely toxic and when combined with the moisture in eyes, mouth and lungs are very irritant.

For cables which need to be 'Halogen Free' and 'Flame Retardant' other non-halogen flame retarding elements like alumina-trihydrate (ATH) can be used instead of Halogens, but while effective in



retarding flame propagation these fillers often negatively affect the polymer by reducing dielectric performance or affecting mechanical and water resistance. For this reason additives like ATH are mostly used only in cable jackets. Halogen Free Flame Retardant cables most often use a more pure polymer like PE, XLPE or EPR for the insulation which has good dielectric and mechanical properties but may not be very flame retardant.

Electric Cables: Propagation performance in fire

Often the best flame retardant cables are halogenated because both the insulation and outer Jacket are flame retardant but when we need Halogen Free cables we find it is often only the outer jacket which is flame retardant and the inner insulation is not.

This has significance because while cables with a flame retardant outer jacket will often pass flame retardance tests with external flame, the same cables when subjected to high overload or prolonged short circuits have proved in university tests to be highly flammable and can even start a fire. This effect is known and published (8th International Conference on Insulated Power Cables (Jicable'11 – June 2011) held in Versailles, France) so it is perhaps surprising that there are no com-

mon test protocols for this seemingly common event and one cited by both authorities and media as cause of building fires.

Further, in Flame Retardant test methods such as IEC60332 parts 1 & 3 which employ an external flame source, the cable samples are not pre-conditioned to normal operating temperature but tested at room temperature. This oversight is important especially for power circuits because the temperature index of the cable (the temperature at which the cable material will self-support combustion in normal air) will be significantly affected by its starting temperature i.e.: The hotter the cable is, the more easily it will propagate fire.

It would seem that a need exists to re-evaluate current cable flame retardance test methods as these are commonly understood by consultants and consumers alike to provide a reliable indication of a cables ability to retard the propagation of fire.

If we can't trust the Standards what do we do?

In the USA many building standards do not require halogen free cables. Certainly this is not because Americans are not wisely informed of the dangers; rather the approach taken is that: "It is better to have highly flame retardant cables which do not propagate fire than minimally flame retardant cables which may spread a fire" – (a small fire with some halogen may be better than a large fire without halogens). One of the best ways to make a cable insulation and cable jacket highly flame retardant is by using halogens.

Europe and many countries around the world adopt a different mentality: Halogen Free and Flame Retardant. Whilst this is an admirable mandate the reality is rather different: Flame propagation tests for cables as adopted in UK and Europe can arguably be said to be less stringent than some of the flame propagation tests for cables in USA leading to the conclusion that common tests in UK and Europe may simply be tests the cables can pass rather than tests the cables should pass.

Conclusion

For most flexible polymeric cables the choice remains today between high flame propagation performance with halogens or reduced flame propagation performance without halogens.

Enclosing cables in steel conduit will reduce propagation at the point of fire but hydrocarbon based combustion gasses from decomposing polymers are likely propagate through the conduits to switchboards, distribution boards and junction boxes in other parts of the building. Any spark such as the opening or closing of circuit breakers, or contactors is likely to ignite the combustible gasses leading to explosion and spreading the fire to another location.

While MICC (Mineral Insulated Metal Sheathed) cables would provide a solution, there is often no single perfect answer for every installation so designers need to evaluate the required performance on a "project-by-project" basis to decide which technology is optimal.

The primary importance of fire load

Inside all buildings and projects electric cables provide the connectivity which keeps lights on, air-conditioning working and the lifts running. It powers computers, office equipment and provides

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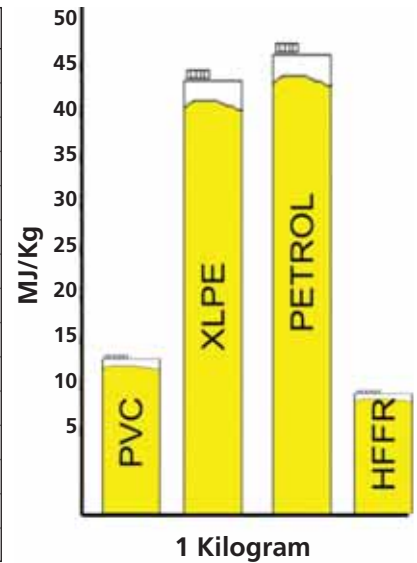
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Table 1

Common Name	Description	MJ/Kg
Petrol		48
XLPE	Polyethylene	46
PP	Polypropylene	46
Nylon 66	Polyamide	33
EPR	Ethylene propylene rubber	28.5
CSP	Chlorosulphonated polyethylene	28
Coal		25
PCP	Polychloroprene rubber	24
Wood		18.5
PVC	Polyvinyl chloride	18
SIR	Silicone Rubber	15.5
ETFE	Ethylene tetrafluoroethylene	13.8
HFFR	Halogen Free Flame Retardant	13
PTFE	Polytetrafluoroethylene	5
MICC	Bare Mineral Insulated Metal Sheathed	0

Table 2



the connection for our telephone and computers. Even our mobile phones need to connect with wireless or GSM antennas which are connected to the telecom network by fiber optic or copper cables. Cables ensure our safety by connecting fire alarms, emergency voice communication, CCTV, smoke shutters, air pressurization fans, emergency lighting, fire sprinkler pumps, smoke and heat detectors, and so many other features of a modern Building Management System.

Where public safety is important we often request cables to have added safety features such as flame retardance to ensure the cables do not easily spread fire, circuit integrity during fire so that essential fire-fighting and life safety equipment keep working. Sometimes we may recognize that the combustion of electric cables produces smoke and this can be toxic so we call for cables to be Low Smoke and Halogen Free. Logically and intuitively we think that by requesting these special properties the cables we buy and install will be safer.

Because cables are installed by many different trades for different applications and are mostly hidden or embedded in our constructions, what is often not realized is that the many miles of cables and tons of plastic polymers which make up the cables can represent one of the biggest fire loads in the building. This point is certainly worth thinking more about.

PVC, XLPE, EPR, CSP, LSOH (Low Smoke Zero Halogen) and even HFFR (Halogen Free Flame Retardant) cable materials are mostly based on hydrocarbon polymers. These base materials are not generally flame retardant and naturally have a high fire load. Cable manufacturers make them flame retardant by adding compounds and chemicals. Certainly this improves the volatility of burning but the fuel content of the base polymers remains.

Tables 1 and 2 above compare the fire load in MJ/Kg for common cable insulating materials against some common fuels. The Heat Release Rate and volatility in air for these materials will differ but the fuel added to a fire per kilogram and the consequential volume of heat generated and oxygen consumed is relative.

The volume in kilometers and tons of cables installed in our buildings and the associated fire load of the insulations is considerable. This is particularly important in projects with long egress times like high rise, public buildings, tunnels and underground environments, airports, hospitals etc.

When considering fire safety we must first understand the most important factors. Fire experts tell us most fire related deaths in buildings are caused by smoke inhalation, temperature rise and oxygen depletion or by trauma caused by jumping in trying to escape these effects.

Smoke

The first and most important aspect of smoke is how much smoke? Typically the larger the fire the more smoke is generated so anything we can do to reduce the spread of fire will also correspondingly reduce the amount of smoke.

Smoke will contain particulates of carbon, ash and other solids, liquids and gasses, many are toxic and combustible. In particular, fires in confined areas like buildings, tunnels and underground environments cause oxygen levels to drop, this contributes to incomplete burning and smoldering which produces increased amounts of smoke and toxic byproducts including CO and CO₂. Presence of halogenated materials will release toxic Halides like Hydrogen Chloride together with many other toxic and flammable gasses in the smoke.

For this reason common smoke tests conducted on cable insulation materials in large 3 meter³ chambers with plenty of air can provide misleading smoke figures because complete burning will often release significantly less smoke than partial incomplete burning which is likely in practice. Simply specifying IEC 61034 with a defined obscuration value then thinking this will provide a low smoke environment during fire may unfortunately be little of help for the people actually involved.

Halogens, Toxicity, Fuel Element, Oxygen Depletion and Temperature Rise

It is concerning that Europe and other countries adopt the concept of halogen free materials without properly addressing the subject of toxicity.

Halogens released during combustion are extremely toxic but so too is carbon monoxide and this is not a halogen gas. It is common to call for halogen free cables and then allow the use of Polyethylene because it is halogen free. Burning Polyethylene (which can be seen from the table above has the highest MJ fuel load per Kg of all insulations) will generate almost 3 times more heat than an equivalent PVC cable. This means is that burning polyethylene will not only generate almost 3 times more heat but also consume almost 3 times more oxygen and produce significantly more carbon monoxide. Given carbon monoxide is responsible for most toxicity deaths in fires this situation is at best alarming!

The fuel elements shown in the table above indicate the amount of heat which will be generated by burning 1kg of the common cable insulations tabled. Certainly this heat will accelerate the burning of other adjacent materials and may help spread the fire in a building but importantly, in order to generate the heat energy, oxygen needs to be consumed. The higher the heat of combustion the more oxygen is needed, so by choosing insulations with high fuel elements is adding significantly to at least four of the primary dangers of fires: Temperature Rise, Oxygen Depletion, Flame Spread and Carbon Monoxide Release.

Perhaps it is best to install polymeric cables inside metal conduits. This will certainly help flame spread and minimize smoke because inside the conduit oxygen is limited; however this is not a solution. As said previously, many of the gasses from the decomposing polymeric insulations inside the conduits are highly flammable and toxic. These gases will migrate along the conduits to junction boxes, switch panels, distribution boards, motor control centers, lamps, switches, etc. On entering the gases can ignite or explode with any arcing such as the make/break of a circuit breaker, contactor, switch or relay causing the fire to spread to another location.

Conclusion

The popularity of "Halogen Free" while ignoring the other toxic elements of fire is a clear admission we do not understand the subject well nor can we easily define the dangers of combined toxic elements or human physiological response to

them. It is important however, that we do not continue to design with only half an understanding of the problem. While no perfect solution exists for organic based cables, we can certainly minimize these critically important effects of fire risk:

One option maybe to choose cable insulations and jacket materials which are halogen free and have a low fuel element, then install them in steel conduit or maybe the American approach is better: to use highly halogenated insulations so that in case of fire any flame spread is minimized.

For most power, control, communication and data circuits there is one complete solution available for all the issues raised in this paper. It is a solution which has been used reliably for over 80 years. MICC cables can provide a total and complete answer to all the problems associated with the fire safety of organic polymer cables.

The copper jacket, magnesium oxide insulation and copper conductors of MICC ensure the cable is effectively fire proof. MICC cables have no organic content so simply cannot propagate flame or generate any smoke. The zero fuel load ensures no heat is added and no oxygen is consumed.

Being inorganic MICC cables cannot generate any halogen or toxic gasses at all including CO.

Unfortunately many common cable fire test methods used today may inadvertently mislead people into believing the polymeric flexible cable products they buy and use will perform as expected in all fire situations. As outlined in this paper, sadly this may not be correct. **APF**

Richard Hosier is Sales Director in Singapore and Malaysia for the TRM & MICC Group, based in Singapore. He has been working in the electrical cable industry for thirty years specialising in the fire performance of cables. He has lectured at institutions, universities and has published several technical papers as well as serving on three Australian and New Zealand technical standards committees for cables and fire performance wiring systems.

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Three Keys to Swift-

Understanding how the boat operates essential to successful swift-water res

Dalan Zartman

Rescue Methods

Of all the technical rescue disciplines, I find swift water to be one of the least forgiving. Rivers are incredibly dynamic environments with an unlimited supply of hazards that can change a seemingly uneventful rescue sequence into a nightmare.

Each boat will perform differently in the water as the loads within the boat change. I have observed two prevalent mistakes that novice boat operators and rescuers make. First, they simply do not understanding the performance characteristics of their boat and motor. Improper operating techniques may result in rotational capsizing or sudden surges or losses in position in the river. Either of these actions can put rescuers in the water. Second, they develop tunnel vision on a specific problem and forget about the river. The river never stops coming at you and losing sight of it can result in rapid loss of position and an ill-advised ferry angle.

For the purpose of this article, we will be discussing the most common river-based boats within the rescue service – 3.6 metres to 4.9 metres crafts including standard inflatables, tunnel hulls (a boat hull that uses two typically planing hulls with a solid centre) and jon boats (a flat-bottomed boat constructed of aluminium, glass fibre, or wood with one, two, or three bench seats). Before effectively operating these boats, we need to have a firm grasp of three basic factors:

- Load capacity.
- Performance characteristics.
- Immediate actions.

I am a strong advocate of keeping boat personnel to a minimum in swift-water applications to ensure optimal performance of the craft. The best layout for a boat rescue team is an operator or pilot, a primary rescuer and a secondary rescuer if absolutely necessary.

Performance Characteristics

Once the load capacity is known, it needs to be applied on the river to analyse its relationship to performance characteristics of the boat. Generally, inflatable crafts are much more stable than jon boats. This allows more personnel to be placed in the boat with less concern for placement or position. Jon boats can be highly unstable and require great attention to load positions in the boat to prevent taking on water and capsizing. This principle is particularly important when turning the boat or applying sharp ferry angles.

During these manoeuvres, it is imperative that the crew understands how reactive the boat is to load placement near its sides. In unstable boats, crews should shift their weight to the downriver side when performing turns if the goal is to maximise boat stability. However, the result is a wide turn radius. If a tighter turn is desired, the crews must be aware of their particular boat's

It is important to know how to trouble-shoot and take corrective actions when things do not go as planned. Know your motor inside out. Have a systematic and rapid checklist that you progress through to correct the problem.

Load Capacity

Boats may be equipped with a load-capacity placard that displays the maximum allowable weight and/or persons that can be in the boat. This calculation is based on a standard U.S. Coast Guard formula that multiplies the length of the boat times the width of the boat and divides it by 15. For example: in imperial measure, a 15-foot-long by 8-foot-wide boat would result in $120/15 = 8$.

This formula is based on a 150 lb (68 kg) person, and I do not know many rescuers that weigh 150 lbs. So, use a coefficient of 20 to be on the safe side. This would result in a maximum person load of six as opposed to eight. You also need to consider the increased drag and weight that is generated as you approach the maximum load.

reaction to inside loading to ensure that they do not overload it and allow water to rush into the boat and cause a rotational capsize.

Each of the primary boat types turn very differently. Standard inflatable boats typically perform a sliding motion across the surface of the water. Jon boats and V-bottom boats slide less and will naturally turn tighter. Tunnel-hull boats have two rails in the water that produce extremely tight turns that generate up to four Gs when performed at maximum operating speed.

Motor Operations

When setting up a boat, the motor must be set at the appropriate angle with the appropriate propeller to ensure that maximal water is drawn through the propeller and not an air cavity.

Water Boat Rescue

and how the river behaves are cues

It is often impractical to adjust the trim of the motor while on the river by any means other than load positioning. For example, many tunnel-hull boats need to have as much load in the rear as possible to generate enough initial torque to react with maximum propulsion. If a crew knows they are going to perform a peel out or a tight down river eddy turn, they should shift their weight just prior to performing that manoeuvre. Bringing a boat to plane or maximum operating speed may also be impacted by load distribution in the boat.

The last component to be evaluated is overall capability of the boat as it relates to CFS or water movement. Boat crews must know the limitations of their boat – especially how much current is too much for the boat configuration. This will be

is staring at that receiving point on the boat as opposed to looking up river to hold position.

In a narrow shoot with fast water, even a 15-degree ferry angle can cause a boat to careen towards the bank and the operator may not be able to recover boat position in time to avoid further injury to the victim and damage to the boat and crew. Conversely, an operator who is completely honed in on a hazard in the river but has lost focus on his rescue crew and the victim may fail to respond appropriately to their needs.

We address this dichotomy during training by encouraging operators to divide their senses. They are instructed to keep their eyes on the water and their ears attuned to their rescuers.

The key to successful boat rescue is to develop refined operating skills through repetition and exposure to different water conditions, as well as strong situational and environmental awareness using all senses. Boat-based rescue operations can be tremendous assets or liabilities to rescue operations.

based on the load in the boat, the drag of the boat design and construction, and the horsepower and prop setup of the motor.

When Things Go Wrong

It is also important to know how to trouble-shoot and take corrective actions when things do not go as planned. Know the motor inside and out. If propulsion is lost or the motor dies, have a systematic and rapid checklist that you progress through to correct the problem.

The crew should also have a course of corrective actions to try to maintain a safe boat position in the water with paddles. This is one example of immediate actions, which should be rehearsed and performed with great repetition to develop muscle memory.

Once the boat itself has been addressed, operators and crews need to understand the dynamics of swift water. Rescue sequences typically require a large array of boating skills from ferrying, hovering and peel outs to river reading, avoiding and identifying hazards and victim retrievals.

Divided Attention

One of the hardest disciplines to develop in novice operators is the ability to keep the nose of the boat up river with no ferry angle and maintain position in the river while a victim is being loaded. This is commonly referred to as hovering.

Operators will naturally want to shift their focus towards the rescuers and victim during loading. This generally results in an accidental ferry angle being set towards the victim because the operator

Training Tips

One of the best drills or events to apply this is in victim pick-ups. The boat will always approach the victim from the down river side. We require operators to maintain boat position and hover during a victim pickup as well as capture the victim and perform a down river peel out with the victim on the down-river side of the boat.

In more forgiving water conditions, operators should always bring their motors to neutral during victim pickups to negate the possibility of a prop injury to the victim. In swift water however, losing operational control of the boat by going to neutral could be catastrophic.

We train our rescuers to convey specific verbal commands to the operator when they grab, capture and pull in a victim or command a peel out. If the rescuer is losing the victim, he or she communicates to the operator to either “peel out” to come around and relieve current pressure on the victim or “kill it” to bring the motor to a neutral or zero energy state.

The key is to develop refined boat operating skills through repetition and exposure to different water conditions as well as strong situational and environmental awareness using all senses. Boat-based rescue operations can be tremendous assets or liabilities to rescue organizations.

Get the boats out of the bay and onto the water to insure they will be an asset. **APF**

This article appeared originally in the June 2013 edition of FireRescue1. The FireRescue1 website is at <http://www.firerescue1.com>.

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Website: www.shimatonet.co.jp

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Dealer/Distributor**NEW ZEALAND****AIR TECHNOLOGY LTD**

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PO Box 305065 Triton Plaza
North Shore, Auckland 0757, New Zealand
Contact: Ross Irvine
Tel: 64-9-478 9995 Fax: 64-9-478 6221
Website: www.divecompressors.co.nz

Dealer/Distributor**PHILIPPINES****DIVE SUPPLY SUBIC, INC.**

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Perimeter Road, Subic Freeport Zone
2222 Olongapo

Dealer/Distributor**AQUAVENTURE WHITETIP DIVE SUPPLY – BORACAY**

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Dealer/Distributor**AQUAVENTURE WHITETIP DIVE SUPPLY – CEBU**

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Dealer/Distributor

CHINA**ANCOM SYSTEMS INC**

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Email: info@askagroup.com
Website: www.askagroup.com

Dealer/Distributor**KOREA****NINE TECO CO LTD**

33, Dapsimni-ro 41-gil,
Dongdaemun-gu, Seoul 130-752
Rep. of Korea
Tel: +82 2 2242 3317 Fax: +82 2 2243 3150
Email: kuknine@hanmail.net
Website: www.ninevinch.com

Dealer/Distributor**SINGAPORE****TETRA FIRE ENGINEERING PTE LTD**

10 Ubi Crescent #05-04
Ubi Techpark, Singapore 408564
Contact: Mr T S Lee
Tel: (65) 6841 4429 Fax: (65) 6841 5267
Email: tetra@singnet.com.sg

Dealer/Distributor**ARCHER (S) PTE LTD**

55 Ubi Ave 1 #07-05
Singapore 408935
Tel: +65 6844 6234 Fax: +65 844 6159
Email: sales@archer-systems.com
Website: www.archer-systems.com

Dealer/Distributor**TAIWAN****PAO TAI INTERNATIONAL ENTERPRISE LTD**

No.39, Lane 177, Dahua Rd, Jhongli City
Taoyuan County 320
Taiwan (R.O.C.)
Contact: Mr Sunter Sun
Mobile: 0933-114-090 Fax: 886-3-4632376

Dealer/Distributor

**AUSTRALIA****FIRE PROTECTION TECHNOLOGIES PTY LTD**

Unit 1/251, Ferntree Gully Road
PO Box 75, Mt Waverley, Victoria 3149, Australia
Tel: +61 3 8542 8901 Fax: +61 3 9543 9109
Email: Enquiries@fire-protection.com.au
Website: www.fire-protection.com.au

Dealer/Distributor**BANGLADESH****MARS SYNDICATE**

114A, New DOHS, Eastern Rd. Lane #6
Mohakhali Dhaka # 1206, Bangladesh
Contact: Ms Purabi Matin CEO/
Mr Akm Rasid Hassan Technical
Tel: +88 02-882 6893/+88 018-1922 6281
Email: marssyndicate@gmail.com

Dealer/Distributor**CHINA****I-SAFE FIRE EQUIPMENT (TIANJIN) LTD**

No.16, Chong Qing Street, Jin Nan District
Tian Jin, P.R. China
Tel: +86 22 8882 6965 Fax: +86 22 8882 6970
Email: sales@isafe-fire.com

Dealer/Distributor**HONG KONG****THE JARDINE ENGINEERING CORPORATION LTD**

5/F Tower A, Manulife Financial
223-231 Wai Yip Street
Kwun Tong, Kowloon, Hong Kong
Tel: 852 2807 4684 Fax: 852 2503 4210
Email: tommy.tam@jec.com
Website: www.jec.com

Dealer/Distributor**INDIA****NEWAGE FIRE PROTECTION ENGINEERS**

7, Champaklal Udyong Bhavan
Sion (E) Mumbai 400 022, India
Tel: +91 22 2407 7421 Fax: +91 22 2407 4229
Email: info@newage-india.com
Website: www.newage-india.com

Dealer/Distributor**INDONESIA****PT. KALIMUTU MITRA PERKASA**

Sentra Latumenten AA#18
Jl. Raya Latumenten Kav. 50, Jakarta 11460
Tel: +62 21 5696 0197 Fax: +62 21 5696 0497
Email: suastika@kalimutu.com

Dealer/Distributor**PT. KENCANA LINTAS MENTARI**

Jl. Pangeran Jayakarta, 85AK Jakarta 10730, Indonesia
Tel: +62 21 628 1933 Fax: +62 21 628 1976
Email: priyana@cbn.net.id

Dealer/Distributor**KOREA****GM ENGINEERING & SUPERVISION CO LTD**

Unit D-1209, Gwangmyeong Techno Park
#60 Haan-ro, Gwangmyeong-si, Gyeonggi-do, Korea
Tel: (82) 02-844-8588 Fax: (82) 02-846-9767
Mobile: (82) 010-5036-3123
Email: ts.jeong@gmens.co.kr

Dealer/Distributor**MALAYSIA****FIKE ASIA PACIFIC SDN BHD**

18B, 2nd Floor, Jalan Astak L U8/L, Bukit Jelutong
40150 Shah Alam, Selangor, Malaysia
Tel: +60 3 7859 1462 Fax: +60 3 7859 1461
Email: chun-wah.leong@fike.com
Website: www.fike.com

Representative Office**SUKIADA ENGINEERING SDN BHD**

No. 20 Jalan Astaka L U8/L, Bukit Jelutong
40150 Shah Alam, Selangor, Malaysia
Tel: +60 3 7845 2008 Fax: +60 3 7845 6008
Email: bkwwong@sukiada.com.my
Website: www.sukiada.com.my

Dealer/Distributor**NEW ZEALAND****FIRE PROTECTION TECHNOLOGIES LTD**

Unit B1, 8 Henry Rose Place, Albany 0632
North Shore, Auckland, New Zealand
Tel: +64 (09) 415 5488 Fax: +64 (09) 443 7867
Email: Enquiries@fire-protection.com.au
Website: www.fire-protection.com.au

Dealer/Distributor**PAKISTAN****MGH ENGINEERING AND CONTROL PVT LTD**

H. # 20 St., #5/A Kot Shahabdin, Shahdrah
Lahore 54950, Pakistan
Tel: +92 42 7913064 Fax: +92 42 7913064
Email: mansoorshaker@yahoo.com
Website: www.mgheng.com

Dealer/Distributor**PHILIPPINES****FIRE SOLUTIONS INC**

1028 Malaya Street, Malanday Marikina City
1805 Philippines
Tel: +63 2 371 9774 Fax: +63 2 374 3041
Email: firesolutions@skyinet.net

Dealer/Distributor**SINGAPORE****AZCEND ASIA PTE LTD**

Blk 21, Kallang Avenue #04-165, Singapore 339412
Tel: (65) 6299 0798 Fax: (65) 6299 3735
Email: Chiaw.fs@azcendasia.sg

Dealer/Distributor**SRI LANKA****BUILDING SERVICES (M&E) ENGINEER INTERNATIONAL PVT LTD**

122, Dawson Street, Colombo 02, Sri Lanka
Tel: +94 11 4717 500 Fax: +94 11 245 4653
Email: bldserv@sltnet.lk

Dealer/Distributor**TAIWAN****SUNMORN INC**

7F-2, 76, Nan Jing W. Road, Taipei 10352, Taiwan
Tel: +886 2 2550 3500 Fax: +886 2 2550 5350
Email: merylyu@sunmoreinc.com
Website: www.sunmoreinc.com

Dealer/Distributor**THAILAND****ANTI-FIRE CO LTD**

316-316/1, Sukhumvit 22 Road, Klongtoey
Bangkok 10110, Thailand
Tel: +66 2 260 4565 Fax: +66 2 258 2422
Email: sithichai@antifire.com
Website: www.antifire.com

Dealer/Distributor**VIETNAM****EUROPEAN TECH JSC**

No. 50, 218/27, Lac Long Quan Street
Tay Ho Dist., Hanoi, Vietnam
Tel: +84 4 3755 7179 Fax: +84 4 3755 7178
Email: mscee@vnn.vn

Dealer/Distributor

FIRE FIGHTING ENTERPRISES

AUSTRALIA**AMPAC TECHNOLOGY PTY LTD**

7 Ledger Road, Balcatta, Western Australia 6021
Tel: +618 9242 3333 Fax: +618 9242 3334
Website: www.ampac.net

Dealer/Distributor**KOREA****HI MAX CO LTD**

Sicox Tower, 115-Ho 513-14, Sangdaewon-Dong
Jungwon-Gu, Sungnam-City, Kyungki Do, Korea
Tel: +82 742 1190 Fax: +82 742 7698
Email: himax@himax119.co.kr
Website: www.himax119.co.kr

Dealer/Distributor**NEW ZEALAND****AMPAC INDUSTRIES LTD**

PO Box 100-149, North Shore Mail Centre
Glenfield, Auckland
Tel: +64 94438072 Fax: +64 94438073

Dealer/Distributor**SINGAPORE****ACCLAIM SYSTEMS PTE LTD**

Blk 104, Boon Keng Road, 05-01, Singapore 339775
Tel: +656 2990 798 Fax: +656 299 3735

Dealer/Distributor**ALARM SUPPLY PTE LTD**

63 Jalan Pemimpin, 03-07
Pemimpin Industrial Bldg, Singapore 577219
Tel: 00 656 258 3445 Fax: 00 656 258 6428

Dealer/Distributor**TAIWAN****HORING LIH IND CO LTD**

4f No 18 Lane 327 Chung Shan Road
Sec 2, Chung-Ho-City, Taipei Hsien, Taiwan
Tel: +886 2224 87599 Fax: +886 2224 07752

Dealer/Distributor**THAILAND****TEEYA MASTER SYSTEMS CO LTD**

100/101-102 Vongvanji, Building B, 30th Flr
Rama 9 Road, Huaykhwang
Bangkok 10320, Thailand
Tel: +662 2 6451130 Fax: +662 2 2488540

Dealer/Distributor

HD FIRE PROTECT PVT LTD

AUSTRALIA**HD FIRE PROTECT PTY LTD**

58/37, Slobodian Avenue, Eight Mile Plains
QLD - 4113, Australia
Tel: +61 433 194 344
Email: pacific@hdfire.com

Representative Office**INDIA****HD FIRE PROTECT PVT LTD**

C-36, Nandanvan Industrial Estate
Lal Bahadur Shastri Marg
Opposite ACC Research Centre, Thane, Mumbai
Maharashtra 400604, India
Tel: +91 22 2582 6958
Email: info@hdfire.com
Website: www.hdfire.com

Representative Office**INDONESIA****PT TRIMITA WUJUD REKANUSA**

Jl. Gunung Sahari Raya 51/8
Jakarta Pusat 10610, Indonesia
Tel: +62 21 4227632
Email: exports@hdfire.com

Dealer/Distributor

HOLMATRO

AUSTRALIA**CHUBB FIRE & SECURITY**

149-155 Milton St Ashfield, NSW 2131 Australia
Tel: +61 392 649 796
Email: Joan.Lambert@chubb.com.au
Website: www.chubb.com.au

Dealer/Distributor**BANGLADESH****SPERRY INTERNATIONAL**

5/5 Block-A, 1st Floor, Iqbal Road
Mohammedpur Dhaka-1207, Bangladesh
Tel: +88 029 110 264
Email: SMNazrul@sam-sperry.com
Website: www.sam-sperry.com

Dealer/Distributor**BHUTAN****TCD TRADER**

PO Box 792 Changjalu, Thimphu Bhutan
Tel: +975 178 328 53
Email: TDorji212@gmail.com
Website: www.tcdtrader.com

Dealer/Distributor**BRUNEI****IECS**

8A Simpang 558, Jalan Pasir Kampong Berakas
BB1314 Brunei, Darussalam
Tel: +673 877 79 68
Email: IECS.Brunei@gmail.com

Dealer/Distributor

CAMBODIA**FIRESAFE CAMBODIA**

165 Sotheros blvd, Phnom Penh Cambodia
Tel: +855 12 380 211
Email: Paul@firesafecambodia.com
Website: www.firesafecambodia.com

Dealer/Distributor**CHINA****HOLMATRO CHINA**

No 1801, Pangjin Road, Wujiang ETDC 215200
Suzhou, China
Tel: +86 512 6380 7060
Email: china@holmatro.com
Website: www.holmatro-china.com

Regional Office**FIJI****PIONEER SUPPLIES**

161 Toorak Road Suva Fiji Islands
Tel: +679 331 27 37
Email: Mahesh@pio-sup.com
Website: www.pio-sup.com

Dealer/Distributor**HONG KONG****ABLESLINK COMPANY**

Unit B4, 2/f., Block B, Sheung Shui Pl.
3 Ka Fu Close Sheung Shui
New Territories Hong Kong
Tel: +852 2466 4568
Email: Ableslink@yahoo.com

Dealer/Distributor**INDIA****RESQ TECHNOLOGIES**

C-202, Shilalekh Opp., Police Stadium Shahibag
Ahmedabad – 380 004 India
Tel: +91 942 731 01 59
Email: RESQ.Technologies@gmail.com
Website: www.resqtechnologies.com

Dealer/Distributor**INDONESIA****ESA KARYA MANDIRI**

Jl. Danau Sunter Utara Kav. 60
Rukan Sunter Terrace Blok
C22 Jakarta 14350 Indonesia
Tel: +62 212 946 15 39
Email: EsaKarya@cbn.net.id

Dealer/Distributor**JAPAN****AKAO**

Shin-machi 4-13-1 Nishi-ku Osaka-fu
550-0013 Japan
Tel: +81 66 532 4131
Email: eigyo@akao-co.co.jp
Website: www.akao-co.co.jp

Dealer/Distributor**KOREA****KYUNG JIN INTERNATIONAL**

Kyung Jin B/D. 118-58 Yongdoo-dong
Dongdaemun-gu, Seoul Korea
Tel: +82 22 38 21 86
Email: info@kyungjintltd.com
Website: www.kyungjintltd.com

Dealer/Distributor**MACAU****TCT TRI-CONTINENTAL TRADING**

4/F-E, Dynasty Plaza Bldg.
411-417 Ald. Dr. C. D'Assumpção Macau Macau
Tel: +853 7500 08
Email: TCT@macau.ctm.net

Dealer/Distributor**MALAYSIA****PANDAN NIAGA**

No81A, Jalan tabla 33/21, Shah Alam Techn. p
Seksyen 33 Shah Alam Selangor
Darul Ehsan 40400 Malaysia
Tel: +60 351 221 310
Email: PNSB@pn.com.my
Website: www.pn.com.my

Dealer/Distributor**MONGOLIA****NANOPLANET**

House #3, 6th Khoroo, 10th Khoroolol
Bayangol District, Ulaanbaatar 16081 Mongolia
Tel: +976 88 09 66 48
Email: info@planet-mongolia.com
Website: www.nano.planet-mongolia.com

Dealer/Distributor**NEW ZEALAND****CHUBB FIRE & SAFETY PRODUCTS**

3 Fisher Crescent (Private Bag 92207)
Mt Wellington Auckland New Zealand
Tel: +64 927 072 34
Email: FireandSafety@chubb.co.nz
Website: www.chubb.co.nz

Dealer/Distributor**PAKISTAN****HASEEN HABIB TRADING**

7, Shaheen View, Block 6
PECHS Main Shahræ Faisal
Karachi Pakistan
Tel: +92 213 452 62 40
Email: FBarry@haseenhabib.com
Website: www.haseenhabib.com

Dealer/Distributor**PHILIPPINES****WALLGREEN INDUSTRIAL VENTURES CORP**

62 West Avenue
Quezon City 1104 Philippines
Tel: +63 241 108 18
Email: WIVCOR@yahoo.com

Dealer/Distributor**SINGAPORE****ADVENTRA**

48 Changi South St. 1 486130 Singapore
Singapore
Tel: +65 689 822 83
Email: PK.Tan@adventra.com.sg
Website: www.adventra.com.sg

Dealer/Distributor**SRI LANKA****HALCHEM LANKA**

No.07, Siri Dhamma Mawatha
Colombo 10 Sri Lanka
Tel: +94 112 677 941
Email: inquiries@halchem.net
Website: www.halchem.net

Dealer/Distributor**TAIWAN****PARKSON TRADING**

3F No. 50, Huaning Road
Guo-Shan Dis. 80471 Kaohsiung City
Taiwan
Tel: +886 75 52 16 50
Email: PTCKPeng@parkson.com.tw

Dealer/Distributor**THAILAND****CHASE ENTERPRISE (SIAM)**

497 Prapinklao Road, Bangyeekhan
Bangplad, Bangkok 10700 Thailand
Tel: +66 281 940 00
Email: ChaseSiam@chasesiam.com
Website: www.chasesiam.com

Dealer/Distributor**VIETNAM****WETEC TECHNOLOGY EQUIPMENT**

10th Floor, 9 Lang Ha, Ba Dinh District Hanoi Vietnam
Tel: +84 945 582 626
Email: Khoa.TD@wetec.vn
Website: www.wetec.vn

Dealer/Distributor

HUSQVARNA CONSTRUCTION PRODUCTS

AUSTRALIA**HUSQVARNA AUSTRALIA PTY LTD**

4 Pioneer Ave, Tuggerah, NSW 2259, Australia
Tel: +61 1300 487 782 Fax: +61 8 8371 0990
Website: www.husqvarnacp.com.au

Representative Office**CHINA****HUSQVARNA FAR EAST LIMITED**

38, Xin Jia Road, Colliman Industrial Park
Haicang Xin Yang Industrial District
361022 Xiamen, Fujian Province, China
Tel: +86-592 6518 940
Email: sales.asia@husqvarna.cn
Website: www.husqvarnacp.com

Representative Office**HONG KONG****OWP (HONG KONG) CO**

Flat A, 11/F, Kingswell Commercial Tower
171-173 Lockhart Road, Wanchai, Hong Kong
Tel: +852 2877 3131 Fax: +852 2877 3336
Email: owp@netvigtor.com

Dealer/Distributor**INDIA****PRIME TECHNOLOGIES**

LP-40 E, Maurya Enclave
Pitampura, Delhi -110088, India
Tel: +91-9811730146
Email: primetechnology@gmail.com

Dealer/Distributor**INDONESIA****PT. BINA BERKAT SENTOSA**

Ruko Angke Square Blok A No. 10
Jl. Pangeran
Tubagus Angke Jakarta Barat 11460
Indonesia
Contact: Andie
Tel: +622156954100, 56944199
Fax: +622156944199
Website: www.binaberkat.co.id

Dealer/Distributor**KOREA****KYUNG JIN INTERNATIONAL LTD**

Kyung Jin B/D 118-58 Yongdoo-Dong,
Dongdaemun-Gu, Seoul, Korea
Tel: +82 2 2238 2187
Email: hoon@kyungjintltd.com

Dealer/Distributor**MALAYSIA****DEFIX CONCRETE PRODUCTS SDN BHD**

No 1, Lorong Jintan 2, Taman Supreme,
Off Jalan Cheras, 56100, Malaysia
Tel: +6-03-91348600
Email: defixcp@gmail.com

Dealer/Distributor**PHILIPPINES****CUT & BREAK DIAMOND PRODUCTS INC**

142 West Avenue, Barangay Philam
Quezon City 1104, Philippines
Tel: +632-664-5583 Fax: +632-436-1059
Email: cutandbreak@gmail.com

Dealer/Distributor**SINGAPORE****HUSQVARNA FAR EAST LIMITED**

38, Xin Jia Road, Colliman Industrial Park
Haicang Xin Yang Industrial District
361022 Xiamen, Fujian Province, China
Tel: +86-592 6518 940
Email: sales.asia@husqvarna.cn
Website: www.husqvarnacp.com

Representative Office**TAIWAN****HUSQVARNA FAR EAST LIMITED**

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Colliman Industrial Park
Haicang Xin Yang Industrial District
361022 Xiamen
Fujian Province, China
Tel: +86-592 6518 940
Email: sales.asia@husqvarna.cn
Website: www.husqvarnacp.com

Representative Office**THAILAND****HUSQVARNA FAR EAST LIMITED**

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Colliman Industrial Park
Haicang Xin Yang Industrial District
361022 Xiamen
Fujian Province, China
Tel: +86-592 6518 940
Email: sales.asia@husqvarna.cn
Website: www.husqvarnacp.com

Representative Office**VIETNAM****HUSQVARNA FAR EAST LIMITED**

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Haicang Xin Yang Industrial District
361022 Xiamen
Fujian Province, China
Tel: +86-592 6518 940
Email: sales.asia@husqvarna.cn
Website: www.husqvarnacp.com

Representative Office

LHD GROUP (Lion Apparel)

AUSTRALIA

LHD GROUP AUSTRALIA P/L

Unit 3, 15 Dunstan Road, Wingfield
South Australia, 5013, Australia
Tel: (+61) 8 8139 7777 Fax: (+61) 8 8139 7788
Email: lionasia@lionapparel.com
Website: www.lhd-group.com

Representative Office

HONG KONG

LHD GROUP HONG KONG LTD

Unit 1003-1004, 10/F, Block 3
Tins Center, 3 Hung Cheung Road
Tuen Mun, N.T., Hong Kong
Tel: (+852) 2463 2982 Fax: (+852) 2463 2770
Email: totalcarehk@lionapparel.com
Website: www.lhd-group.com

Representative Office



AUSTRALIA

PAC FIRE AUSTRALIA

1/28 Burnside Road, Hallmarc Business Park
Yatala, QLD 4207 Australia
Tel: +61 7 3441 7100 Fax: +61 7 3441 7177
Email: sales@pacfire.com.au
Website: www.pacfire.com.au

Dealer/Distributor

NEW ZEALAND AND ASIA-PACIFIC

(Excluding Australia)

PACIFIC HELMETS (NZ) LTD

PO Box 866, 315 Heads Road
Wanganui 4501, New Zealand
Tel: +64-6-344-5019 Fax: +64-6-344-5376
Email: sales@pacifichelmets.com
Website: www.pacifichelmets.com

Manufacturer/Distributor



AUSTRALIA

ADA (AUSTRALIAN DEFENSE APPAREL PTD LTD)

14 Gaffney Street, Coburg, Victoria 3058
Emergency Services
Tel: +61 3 9353 4552
Email: sales@ada.com.au
Website: www.ada.com.au

Garment Maker

BRUCK

Units 12/13, 79-83 High Street
KEW Victoria 3101, Australia
Contact: Michael Smith
Tel: +61 4 0324 7309
Email: MSmith@Bruck.com.au

Approved PBI Weaver

ELLIOTT AUSTRALIA PTY LTD

23 Vauxhall Street, Virginia QLD 4014, Australia
Tel: +61 7 3265 2944 Fax: +61 7 3265 2903
Website: www.elliottaustralia.com

Garment Maker

LION APPAREL – ASIA PACIFIC

Asia Pacific – Protective Systems Group, Unit 3
15 Dunstan Road, Wingfield
South Australia 5013 Australia
Contact: Regional Director
Tel: +61 8 8139 7777
Email: Faith.mason@lhd-group.com

Garment Maker

PAC FIRE

1/28 Burnside Road, Hallmarc Business Park
Yatala Qld 4207, Australia
Contact: Keith Ward, Managing Director
Tel: +61 7 3441 7100 Fax: +61 7 3441 7177
Email: keith@pacfire.com.au
Website: www.pacfire.com.au

Garment Maker

STEWART & HEATON

150 Francisco Street, Belmont WA 6104, Australia
Contact: Brian Thomson, Business Development Manager
Tel: +61 8 9277 5555
Email: brian.thomson@shcc.com.au

Garment Maker

CHINA

YINGTELAI TECHNOLOGY CO LTD

76 Xihuan Road, ChangPing District
Beijing 102200, China
Contact: Xue Feng LIU, Vice Chairman General Manager
Tel: +86 10 6974 2811
Email: xuefeng@yingtelai.com

Garment Maker

HONG KONG

WAH TAI ENTERPRISES LTD

7/F Block F, Golden Bear Industrial Centre
66-82 Chai Wan KOK Street
Tsuen Wan N.T. Hong Kong
Hong Kong SAR
Contact: Johnny Ho, President, Special Products Division
Tel: +852 2771 6360
Email: jho@wah-tai.com

Agent

INDIA

SYSTEM 55 PRIVATE LIMITED

(Registered office):
105 Nyniappa Naicken Street
Chennai 600003, India
(Office Communication address):
No. B4. Sidco Industrial Estate, Villivakkam
Chennai – 600049, India
Tel: 91 44 26174339/26170407
Fax: 91 44 26173502
Email: admin@system5s.com/systement@dataone.in
Website: www.system5s.com

Dealer/Distributor

KOREA

SEOJIN TEX

Room 201 Kum Ho Building, Soongin-Dong
Jongro-gu Seoul, 110550, Korea (Republic of)
Contact: C J Yoon, Director
Tel: +82 22 253-7905
Email: seojintex@naver.com

Weaver

SAN CHEONG COMPANY LTD

185 Songmoon-Ri-Myun, Cheoin-Gu, Yongin-si
Gyeonggi-Do 449-823
Korea (Republic of)
Contact: Soo Youk Lee
Tel: +82 31 321 4077
Email: isu@sancheong.com
Website: www.sancheong.com

Garment Maker



AUSTRALIA

FIRE & RESCUE AUSTRALIA PTY LTD

190 Main Rd, Blackwood, South Australia, 5051
Contact: Dale Thompson
Tel: +61 8 8370 2739 Fax: +61 8 8370 2738
Email: dale@fireandrescueaustralia.com

Dealer/Distributor

BRT FIRE AND RESCUE SUPPLIES – QLD

12/65 Business Street, Yatala, Queensland, 4207
Contact: Russ Victorsen
Tel: +61 7 3287 5504 Fax: +61 7 3287 5505
Email: rvictorsen@bigredtruck.com.au

Dealer/Distributor

FIRE & SAFETY WA

96 Furniss Rd, Landsdale, Western Australia, 6065
Contact: Karen Leekong
Tel: +61 8 9302 3210 Fax: +61 8 9302 6110
Email: firewa@fireandsafetywa.com.au

Dealer/Distributor

SOLBERG ASIA PACIFIC PTY LTD

3 Charles Street, St. Mary NSW 2760, Australia
Contact: John Boyer (General Manager)
Tel: 61 2 9673 5300
Email: john.boyer@solbergfoam.com
Website: www.solbergfoam.com

Representative Office

SOLBERG ASIA PACIFIC PTY LTD

22 Cannow Street, Ferny Grove, QLD 4055 Australia
Contact: James Perriss – Sales Manager, Eastern Australia, New Zealand & Pacific Islands
Tel: 61 (0)7 3149 3623
Email: james.perriss@solbergfoam.com

Representative Office

SOLBERG ASIA PACIFIC PTY LTD

1/621 Nepean Highway, Frankston South VIC, 3199, Australia
Contact: Ian Collins – Sales Manager, Asia Pacific Region
Tel: 61 (0)3 9787 8356
Email: ian.collins@solbergfoam.com

Representative Office

BRUNEI

RODA IMPIAN JAYA SDN BHD

22, SPG43-38 S.T.K.R.J. LRG 3, Selatan Seria, KB1533
Negara Brunei Darussalam
Contact: Michael Nayagam
Tel: +673 322 5461
Email: michael.n@rodaimpian.com

Dealer/Distributor

FIJI (PACIFIC ISLANDS)

PIONEER SUPPLIES LTD

161 Toorak Road, Suva, Fiji Islands
Contact: Mahesh Chandra
Tel: +679 331 2034 Fax: +679 331 3485
Email: mahesh@pio-sup.com

Dealer/Distributor

INDONESIA

BIOPHORIC PTY. LTD.

Jalan Peternakan II No.12D, Jakarta Barat, Indonesia
Contact: Fordson Tan
Tel: +62 21 5439 7269
E-mail: fordson@biophoric.com

Dealer/Distributor

MALAYSIA

WINTAKE FIRE ENGINEERING SDN. BHD.

12-1, 1st Floor, Jalan Sungai Burung, Y32/Y
Bukit Rimau, Shah Alam, Selangor, 40460
Malaysia

Contact: PL Tam

Tel: +603 5525 1789

Email: pltam@wintakefire.com

Dealer/Distributor

NEW ZEALAND

CONNELL BROS COMPANY

Third Floor, 19 Great South Road
Newmarket, Auckland 1051
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Email: suew@cbcanz.com

Dealer/Distributor

WORMALD

6 Portage Road, New Lynn, Auckland 0600
Contact: Dennis Heath
Tel: +64 9 826 1700 Fax: +64 9 826 1868
Email: dhealth@tycoint.com

Dealer/Distributor

SINGAPORE

CMA ENGINEERING SINGAPORE PTE LTD

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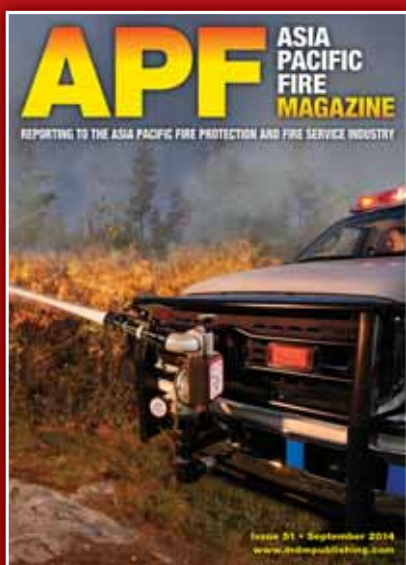
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